CONNECTING THE CLOUDS

The Internet in New Zealand

Keith Newman

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To the Sky King
from the Wordman
Keith Newman
09-09-2008

ACTIVITY PRESS

Dedicated to New Zealand's number 8 wire communications pioneers and entrepreneurs who continue to push the boundaries, ensuring we have an open and uncapturable Internet infrastructure that frees us from the tyranny of distance, the grip of anticompetitive monopolies, and bureaucracies that move 'as slow as molasses in winter'.

Keith Newman, May 2008

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Connecting the Clouds

Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts ... A graphical representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the non-space of the mind, clusters and constellations of data. Like city lights, receding...
Science fiction writer, William Gibson, *Neuromancer*, 1984.

...a world of shared minds that transcends the accidental boundaries of history, the distance of geography, the machinations of institutions, and the mischief of manipulation is potentially one filled with discovery, fulfilment and fascination for all peoples – individually and collectively
Anthony-Michael Rutkowski, executive director of the Internet Society (ISOC,) circa 1994.

Traffic on the Internet has been doubling every 100 days...The Internet's pace of adoption eclipses all other technologies that preceded it. Radio was in existence 38 years before 50 million people tuned in; TV took 13 years to reach that benchmark. Sixteen years after the first PC kit came out 50 million people were using one. Once it was opened to the general public the Internet crossed that line in four years
United States Department of Commerce report, The Emerging Digital Economy, 15 April 1998.

PREFACE

IP everywhere

Fingers and thumbs to zeroes and ones

While the history of radio and television has been well documented, telecommunications is hardly given credit for its immense impact; the terms telegraph, telephone and telecommunications only appear briefly if at all in most reference books, unless you stumble on a couple of niche titles about undersea cables or the early history of the Post Office.

As for the origins of the Internet in New Zealand, well perhaps that was being left until sufficiently forgotten to qualify as history at some time in the future? The trouble with history is that it's rarely written until the eyewitnesses are no longer with us. *Connecting the Clouds* is present history, from the commentators of the time, and in the words of those who watched this all-encompassing infostructure embrace everything in its path.

A combination of two Greek words, 'tele' (far off) and 'phone' (voice or sound) became the term for 'far-speaking', and in one of its earliest forms was associated with music. Charles Wheatstone, co-inventor of the telegraph, used the term 'telephonic', and described his creation as an 'enchanted lyre' as it transmitted music from one room to another.

Samuel Morse gave us what was effectively the first digital messaging, using coded dots and dashes before the telephone took over, but the real advances in what could be transmitted over those intersecting copper lines began to gain credence from the mid-1980s. The great leap forward particle accelerated by the arrival of the Internet protocol (IP everywhere), which signalled the end of the line for proprietary networks, heralding a new era of open systems at a 'world-changing' intersection where previously separate disciplines converged.

Convergence is a biological term for the way unrelated organisms have the tendency to become similar while adapting to the same environment. The word was hijacked in the early 1990s to embrace the process that was breaking down the walls between the broadcast, computing, communications, and entertainment industries by reducing everything to streams of zeroes and ones. Today the majority of data transmissions – voice, images, radio, music and increasingly movies and TV – are carried on the Internet.

What began as a distributed military network that couldn't be crashed, transformed into the jealously guarded playground of boffins and geeks, before exploding into the public domain with such

impact that it soon became indispensable for business and personal communications. By July 2007, with 1.173 billion users or 17.8 percent of the world population on board, the Internet had clearly reached critical mass. We were bored with dial-up and while we complained about the broadband bottleneck, the digital divide and that fact access was still too expensive or not fast enough, the old infostructure was being stretched like an old stocking, with predictions the Internet would undergo more change from 2007 onwards than it had in the previous decade.

HUNT AND PECK

Just over two decades ago, I was wholly reliant on my Remington typewriter; rubbish bin full of screwed-up balls of paper, pondering my next paragraph as I bashed away at the keys in my erratic hunt and peck, two-fingers-and-a-thumb style. Today in my home office I'm on my sixth computer, which has more grunt and capacity that all the previous PCs put together. It sits on a network with a router offering around 3Mbit/sec Internet access on a good day, wirelessly connecting to my laptop with access to total storage capacity of more than 450Gb. I have a full suite of Microsoft applications, plus professional audio and video editing software and a wonderful time-saving tool called Isys, which allows me to index and contextually search the contents of my hard disk so I never have to wonder where I saved things.

I'm not a code monkey or a geek. I am a researcher, writer and interpreter, a story teller, an observer of media, a trend watcher, a one-man clipping service, a music lover, historian and poet. Perhaps that's why bulletin boards, CompuServe and the Internet, excited me from day one. I have written about technology for 20 years, with a particular focus on telecommunications and the Internet. I couldn't wait to get on-line in the late 1980s and now I have difficulty getting off. I have succumbed to information overload. I am addicted and without my wife, artist Paula Novak, strongly encouraging lunchtime walks and computer curfews, I would most likely be even more afflicted by the muscular impact of overuse than I currently am.

I had put together several proposals for a book on the social impact of technology but weekly and monthly deadlines seemed to get in the way. Then circumstances aligned after the TUANZ Broadband Reloaded gathering in Hastings in 2004, when I mentioned the idea to long-time acquaintance Peter Macaulay. He pointed me in the direction of InternetNZ chief executive Keith Davidson, who was considering such a project. After two years of hassling him about his plans, he asked me to put in a tender to write *The History of the Internet in New Zealand.*

Work began in earnest in February 2007 with one of the tightest deadlines I've ever worked to. The truth is, this book began to write itself well over a decade ago. Searching nearly 20 years' worth of text files, rescuing my scrapbooks from the silverfish, flicking through my filing cabinets, sorting piles of musty magazines and the white papers and industry reports I had fortuitously saved, and then conducting about 100 interviews to refresh my memory. What was imagined as a 100,000-word overview soon became an in-depth tome three times that size.

AWAKENED BY THE NET

So what qualified me to write this book apart from having lived through and reported on those pioneering times when the Internet was gaining ground? Well, the Anagram Genius web service delivered up the most intriguing reshuffling of my name: "Net waken him". And it had. Looking back over my family tree, I discovered my grandfather helped put in the first telephone lines along the Wairarapa coast between his service in the Boer War and the First World War. Perhaps the first experiences that began to shape me for writing about technology were, as a six-year-old in 1960,

watching a man in a silver robot suit on a long walk from Wellington, stiffly striding past my temporary home at Tatum Park near Otaki, and a few years later, immersing myself in classic science fiction.

When I managed bands in Sydney in 1974–1976 I played my first games of electronic table tennis and while working for Channel 9, I was shown the mainframe-based teletext-style trading system that used the spare bands on the TV signal for selling goods on-line. I wrote a freelance article about robots for the *Sunday News* in 1979, and a scare story about Big Brother privacy threats for Massey University's *Chaff* magazine that same year. My first encounter with a personal computer was in 1982, when engineer and production guru (the late) John Haines set up the first music database at pioneering FM radio station 2XS in Palmerston North, where I worked in the newsroom.

In 1984 I replaced old-school journo, and later *NZ Herald* leader writer, Garth George, as sub-editor on *Challenge Weekly* newspaper in Auckland, and would return after hours to write poetry and short stories on the Compugraphic typesetting machine, sans the cut-and-paste features, which eluded me. My first PC was an 8088 clone with a dot-matrix printer, which I acquired in exchange for writing PR material for Dale Farnsworth of Software Plus in 1986. It had no hard disk, and the word processing program, First Choice, had to be held in memory, while content was written back to a five-inch floppy disk. I wrote screeds on this early DOS machine. My first serious attempt at writing anything legible about the computing industry however was as a features writer for Suburban Newspapers, when I agreed to let IBM tell me about its new IBM AS/400 operating system. I have never been so confused in my life and was ready to give up there and then.

I worked late shift on the subeditors' desk at the *Auckland Sun* newspaper, where I retrieved copies of *Computerworld* from the rubbish bin. I regularly spotted stories I felt should be followed up for mainstream news. When promises of a comprehensive ISDN network began to appear, I got excited about the potential for pervasive electronic communications. Next thing, I was co-opted as the technology writer and got several months of columns in before the *Sun* went down. It was at that point, in 1988, that I was employed by *Computerworld* to replace journalist Richard Wood, who was in desperate need of a short-lived break from technology writing.

IN AT THE DEEP END

I was immediately in the deep end, writing about relational database management systems, business computing, and the arrival of the PC as a mainstream tool. Still I made every opportunity to keep in tune with communications technology. Before long I had a CompuServe account. I was tutored on the basics of telecommunications by TUANZ secretary William de Hamel; the meandering philosophies of connected concepts and the IZE database – a precursor to HTML – by Andrew Tearle; 'Tony K'' (Tony Krzyzewski), introduced me to Chameleon for FTP, email and early web browsing. 'Mr Internet' John Houlker and his feature-length conversations kept me on a steep learning curve during my on-line infancy; Jim Higgins and others continually stretched my understanding of 'public good' connectivity and Internet governance; and US broadcasting veteran Bob Cooper from Cooper's Beach, who provides 50 plus channels of cable TV to Cable Bay and surrounding areas, shared deep insights into the satellite and television business.

My first Internet service provider (ISP) was Jon Clarke's newly launched Internet Company of New Zealand (Iconz) and later Ihug's satellite 'broadband' service. My first attempts at web publishing came with the special add-on to Microsoft Word, which evolved into Front Page. My first Web pages went live in 1997. Despite what may appear to be a harsh stance on Telecom throughout this book, I have remained an Xtra customer for the past decade.

There have been dozens of mentors and strategic thinkers who made an impact on my understanding; Trevor Eagle is recalled for long lunches, endless ideas, lateral thinking, and introducing me to Geographic Information Systems (GIS); Brian Eardley-Wilmot inspired me with a subscription

to *Fortune* magazine and a copy of *Scientific American* packed full of futuristic thinking from information and communications technology (ICT) industry leaders; John Blackham, a great connector, was forever turning me on to the next great possibility; Alan Morton of Software Images was always full of encouragement and chose *Buzz Words*, my first multimedia poetry CD, as the pioneering Blue Book CD-Rom release in the country, sending it to his extensive database for Christmas 1997.

Until 2007 I remained largely focused on chronicling the unfolding history of the Internet for mainstream and trade publications, with occasional sidelines into poetry, producing music-focused radio programmes for Radio New Zealand National and publishing my first history book, *Ratana Revisited – an unfinished legacy*, for Reed (Raupo).

During my IT-writing era I have contributed to many publications including: *Computerworld; Network World; PC Magazine*, which I edited from 1995–1997; *Metro* – a monthly column from 1996-2000; the *New Zealand Herald*; Oliver Lee's annual *Home Technology* publication, which I have edited for nearly a decade; *MIS* magazine; TUANZ *Topics*; *e.nz*, the professional engineers magazine; and *Telecommunications Review*. In my research I have frequently referred to *The Dominion Post* including the former *InfoTech Weekly* insert and *The Press* IT pages. The *Weekend Herald* and the *Sunday Star Times* are among the few hard-copy newspapers I still read. I Google almost everything else or catch the news on-line from numerous reliable sources.

It was sad to discover along the way that the management at some long-running publications, rather than acting as custodians of a valuable heritage, had binned thousands of photographs of the past because they took up too much room. Even a number of valuable digital archives had also been purged. Some of those who did have valuable archival photographs charged too much to justify using them. It was also strange to watch certain web pages that contained valuable stories about our Internet past disappear only months after I had accessed them, and to observe the changing URLs on a number of sites that made it difficult to create accurate and lasting footnote references for others to follow in my footsteps.

Connecting the Clouds attempts the broadest possible coverage of connectivity from pre-regulation to deregulation and back to re-regulation. My zigzag approach is intended to be chronological, but because the Internet has impacted on almost every area of our society, I have at times digressed in my weaving to explore the evolution of each sector. Each chapter swelled with ridiculous amounts of information and research before being culled, cut, and distilled back to a palatable and hopefully, informed, dialogue.

While I have tried to remain a passionate but independent observer, the facts kept telling me this was no time for a soft sell. An important history needed to told as it unfolded, a story that touches all of our lives, whether we're technically literate or not; the story of how the Land of the Long White Cloud got connected across its own geography and beyond the 'tyranny of distance' out to the wide world.

Through my IT-writing career and in piecing this book together I kept wondering, how it was possible for a former government-owned telecommunications monopoly to become so blatantly obstructive in impeding this nation's advancement? How could various governments hold so many talkfests and commission so many reports, yet so flippantly disregard the long-term impact of technology? How was it that the first nation to deregulate the telecommunications and broadcasting environments could get it so wrong? In *Connecting the Clouds*, I got to explore that thinking in depth.

Making headway in the connected world was left to a handful of pioneering technical gurus in our research, science, and academic institutions who made quiet history learning on the job, often operating way beyond their job descriptions. With no government support they cobbled together a number 8 wire solution to ensure New Zealand became the first nation in the Asia-Pacific region to

have a full connection into the US-based Internet backbone. They then set about creating a fledgling nationwide network that forever set the pace for not only public sector but private sector Internet access.

The Internet is at the heart of the most significant and rapid powershifts in history, opening the way for a new age of creativity, free thinking and collaboration. It redefines everything it comes into contact with – challenging old ways of doing things, breaking down geographical, social, cultural, political, and business barriers. Just as the printing press and the Reformation took the Bible from the hands of the pope and a few priests who claimed to speak for God, so the Internet takes every form of knowledge, arcane and otherwise, to the streets and opens the doors on free and open communication that defies distance and dogma. Never before have like-minded people had such an opportunity to find each other.

Connecting the Clouds is dedicated to the pioneers who brought us the Internet and the ISPs and technical innovators who helped transform it into what it is becoming today; to the persistence of the radical thinkers, entrepreneurs, and visionaries who caught the technology tidal wave and learned to surf it before most of us had even heard of broadband. A double dedication to the dedicated ones who are still there after many frustrating years, still trying to shed light on the path we've yet to tread.

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1

The tyranny of distance

Reaching out to the world

Aotearoa, rugged individual glisten like a pearl
At the bottom of the world
The tyranny of distance didn't stop the cavalier
So why should it stop me? I'll conquer and stay free…

Six Months in a Leaky Boat, Split Enz

We've come a long way from flag-waving semaphore and the dot-dash-dot of Samuel Morse's electronic forerunner of the digital age, and our first glimpse of the device that would cause its users to respond more rapidly to its shrill beckoning than a knock at the door.

In the 21st century we can't get enough of the telephone and the technologies it has spawned – from the dinky pocket cellular phone that doubles as an MP3 player, electronic diary, data repository, and camera, to that most influential of all offspring, the Internet.

The Internet is a modern miracle, a network of millions of intersecting networks, a spider's Web of connections meshing the globe, crossing all time zones, and all political, social, and geographical borders wherever a telecommunications infrastructure exists.

The Internet and the World Wide Web are often considered interchangeable, but the Internet itself is essentially the physical infrastructure. It's made up of hundreds of thousands of servers (powerful computers), which host information and services, with routers and switches acting like electronic posties, passing messages and requests for information between networks of undersea, underground, overhead, and wireless networks.

The Web is essentially a hypermedia system for organising information. It didn't come into existence until 1990 but when it did, Internet use went through an exponential growth curve. You can type in a specific address or URL (uniform resource locator) in your Web browser and access information and web sites anywhere in the world. The Web has undergone an astounding evolution from a humble research community library system to a free-for-all, do-it-yourself publishing network. In 2000 it had reached 1.8 billion pages and by 2007 that had grown to 135 billion.[1]

The Internet has given us email, newsgroups, peer-to-peer computing, on-demand music and

movie clips, electronic banking, e-government, community networks, on-line shopping, and information at our fingertips. Social networking and blog sites enable people to share their thoughts, hobbies, photos, and home movies and recommend music, films, books, and ideas in a manner that has the capability to stimulate mass market shifts in perception. This transformational technology, which bridges the 'six degrees of separation,' is instrumental in creating hit records or turning flops into box-office successes virtually overnight because people are talking to each other, not just relying on the hype from the producers of their entertainment. The Internet has come of age, and its influence has hardly begun to be understood.

The last time the world faced changes of this magnitude was when technology brought about the industrial revolution. People relocated from the country to cities, transport improved markedly, and consumer goods became widely available. The average citizen's main activity changed from tilling a small piece of soil to working at more specialised jobs in large enterprises. Society was never the same again. The citizens of those countries who were able to industrialise fastest reaped the greatest rewards from the changes. However, some people – those who, through no fault of their own, could not adapt or learn appropriate skills – coped very badly with the changes, as described in the novels of Charles Dickens.[2]

> *"For most of its history, New Zealand had been separated from its major markets, and suffered from the sense of vulnerability that distance created. In times of war, we felt vulnerability even more acutely. And when Britain joined the European Community in 1973, that vulnerability became a sense of abandonment, of our umbilical cord being cut. As a nation dependent on sea-borne trade, we always faced the danger of becoming marooned on our isolated island. Now, because of both the advancement in communications, and the consequent changes in the way the global market operates, we find ourselves not on a desert island but in an oasis – with all mod cons provided…," as Commerce Minister Philip Burdon so aptly described our Internet pre-history in a 1992 speech.*[3]

The past 100 years has seen more pervasive change than history has recorded for the previous millennia. With fire, water, earth, and air harnessed to some degree, and steel and steam opening up industrial horizons, humanity's curiosity extended to harnessing lightning and splitting the atom. Major innovations including the wireless telegraph, broadcast radio and television, the fax, phone, and data communications evolved their separate disciplines. But few could have guessed that in the 21st century these would all be reduced to bits and bytes, moving along a common infrastructure.

The promise of what the future may hold has us sucked in to an endless upgrade path, drawn by a compelling vision of a world where bandwidth is free and we're in touch with anyone, anywhere, anytime. In its wake this revolution has left many markers to remind us how quietly it began and how rowdy things have become lately. To set the tone and pace of our journey into the history of the Internet and its modern-day impact on New Zealand and the world, we need to review the old-school innovations that brought us this far. From the mid-1800s a raft of changes began transforming our ability to communicate.

Aotearoa's remoteness at the bottom of the Pacific and the arrival of its overwhelmingly British colonisers put it in catch-up mode from the start. Town planners, once they had 'acquired' sufficient land to begin preparing for the massive growth ahead, developed 'little Englands' across the landscape. Everyone, it seemed, spoke of the old country and hungrily devoured news from abroad, even if it took five months to get here.

Surveyors marked out roads to make the most habitable areas accessible and devised the best routes to link them to each other. Trade and commerce was a driving force, moving passengers

and their worldly goods, delivering livestock and implements to help tame the land, and importing and distributing goods and food to sustain the life these newcomers had become accustomed to.

ANY NEWS FROM HOME?

Being cut off from the mother country was just one of the many hardships endured by the inhabitants of this harsh new environment. Dog-eared publications passed between friends and family, and public meetings were all that kept the community informed of issues of local importance. The only way news from outside New Zealand got through was by word of mouth or old newspapers and magazines delivered on passenger and freight ships as they docked at Auckland, Wellington, and other safe harbours. It is recorded that three ships which arrived in Wellington in late 1840 carried 710 letters and 436 newspapers.[4]

Sailing ships bringing pioneers from Britain had typically taken five months to reach these shores but with the advent of steamships, mail services in co-operation with Australia arrived via Suez within two months. When the Suez Canal opened in 1869 the route from Britain to Wellington was further reduced to less than 48 days.[5] Sailing boats and steamships moved up and down the country, trading and delivering people and goods. Roads were still primitive and rail a futuristic thought.

Bay of Islands shopkeeper William Powditch set up the first registered post office in New Zealand in 1831, followed shortly by J. R. Clendon, who opened an agency. Both were authorised by the New South Wales Government, which had authority over the colony to manage incoming and outgoing mail. Then Lieutenant Governor William Hobson, arriving in 1840, brought with him William Hayes, who became clerk of the Magistrate's Court and postmaster at Kororareka (later Russell). Hayes was dismissed for drunkenness and dishonesty; within a month he was replaced by S. E. Grimshaw, who became the first postmaster of New Zealand. His payment for service was 20 percent of postal receipts.

Hobson tried to establish his own post office system when he moved the capital to Auckland, but the Colonial Office advised the British postmaster general would retain ultimate authority. The Local Posts Act of 1858, two years after the new colony had been given greater autonomy from Australia, allowed for the appointment of a postmaster general and authorised provincial councils to establish post office services, which were to be co-ordinated on a national basis.[6] Ultimately the New Zealand Post Office (NZPO) would take control of banking through the Post Office Savings Bank along with telegraph and telex services, the telephone network for national and international calls, and radio services including contact with ships.

The unstoppable march towards pervasive telecommunications began for New Zealand only 18 years after Samuel Morse's first long-distance line had been built primarily for sending and receiving the cryptic dots and dashes of Morse code.[7] The first moves to dot the landscape with poles and long stretches of wire threaded through insulators, setting the pace for the telecommunications revolution, occurred in the South Island.

Early in the1850s, the population of New Zealand was around 132,000 with pockets of 'civilisation' scattered across both islands. The bulk of the population and wealth was, however, centred in Canterbury, where there had been strong growth in agriculture, and further south in Otago, which was at the epicentre of a major gold rush from 1860. The prospect of gold attracted a huge population of would-be miners and opportunists, all eager to stake claims or service those who were. There was also growing demand for farmers and merchants to have more prompt communications than the mail service and more efficient communications with the centre of imports and exports, at Lyttelton Port.

The first official interest in attempting to break the nation's isolation came in a report from the general telegraph superintendent for Victoria, S. B. McCowan, on 24 July 1858, proposing that Australia and New Zealand be connected by electric cable. His scheme foundered largely because no one could settle on a location for the cable to terminate. The same year the idea of an internal telegraph for the colony was raised by the *Lyttelton Times*, which saw this as a means to broaden its access to news and a potential subscriber base. Two early editors of the newspaper and persistent supporters of the telegraph were William Reeves (father of William Pember Reeves) and Crosbie Ward. The first attempt at building a telegraph was marred by delays, litigation, and a lack of funding. The Canterbury Provincial Council with support from the local paper, approved £1500 for the task and equipment was ordered from British suppliers.

Edmund Green, an experienced telegraph engineer, was hired to come out from England and supervise the installation. He was given £25 and passage for himself, his wife, and five children. When he reached Lyttelton in August 1859 he found the market had slumped, and the province had no money to pay for the equipment ordered. Green successfully sued the authorities to uphold the terms of his contract and pay for the equipment, which included 250 wrought iron poles, 32km of iron wiring, three Wheatstone needle instruments and the necessary batteries and insulators. The shipment arrived in October but remained unused for several years. Green's contract was eventually annulled, and he was paid off by the government for £5.

Further efforts were made during 1859–1860 to press ahead with the telegraph, and the editors of the *Lyttelton Times* continued to lobby for change. A new advocate was found in Alfred Sheath, an experienced telegraph engineer from Birmingham, who had worked for several telegraph companies. He had come to New Zealand to try his hand at sheep farming but in 1861 offered his expertise to help construct the province-wide network. He used some of the imported equipment, replacing the Wheatstone instrument with the latest Morse equipment, which required only one wire and would work over shorter circuits.[8]

New Zealand's first telegraph line, which followed the railway track between Lyttelton and Christchurch, was built by Melbourne company George Holmes and Co, which had also won the contract to put a tunnel through the Port Hills. It was completed at a cost of £1405 on 18 June 1862 and inaugurated by the Canterbury Provincial Council at a special dinner on 1 July, with the Morse sender transmitting 35 words per minute. One of the first messages sent was to Mr Oakes in Christchurch and read: "Mr Oakes is coming round in schooner Colleen Baun with goods. Dog Pedro poisoned and is dead."[9] A second network was quickly established between Port Chalmers and Dunedin. A telegraph office was set up in Picton in 1865, and the following year Blenheim and Nelson followed suit.

CABLING THE COUNTRY

At the same time as the south was constructing its pioneering network, the central government in Auckland was becoming increasingly concerned about its isolation from Canterbury, which had become the economic hub of the country. It was also worried about growing hostilities with Maori tribes in neighbouring regions. The postmaster general devoted a page of his annual report in 1863 to the telegraph. He wanted to see a colony-wide telegraphic network including a Cook Strait cable.[10] There were nine independent telegraph networks covering much of the South Island by the time the first undersea cable was laid across Cook Strait to Wellington.

Creating a cable that could survive the harsh conditions on the ocean floor between the two islands required serious innovation. Rubber wasn't up to the job of insulating the copper. The solution was cutting edge: coagulated latex from trees grown in Malaya, ultimately wrapping seven strands

of cable in layers of jute yarn which would withstand the corrosive oceans and the pressures of the undersea currents.[11] The clipper *Weymouth* first attempted to lay the cable on 27 July 1865, but the tidal rip was so severe the cable broke. The second attempt in August proved successful, and communications between the islands became possible on the 26th of that month. Inter-island traffic initially went through Whites Bay station but the terminal equipment was eventually moved to Blenheim in 1875, with landlines extending east and west from Nelson through the Buller Gorge and Westport.[12]

The first telegraph line in the North Island was a military line from Auckland to Drury, later extended to the Waikato. In 1863 the New Zealand Government established the Electric Telegraph Department, immediately placing the growing number of independent telegraph networks under centralised control. It also took ownership of the Auckland military network and in 1866 started expanding this as part of the Wellington to Auckland route.

Progress was slower getting cable across the North Island, particularly on the main link between Auckland and Wellington. It was a back-breaking job; there were rivers to ford, swamps to navigate, steep hills to climb, and dense bush to penetrate. The pioneering engineers had to hack their way through the terrain, survive flooding and slips, and drag with them the equipment necessary to string up the wiring for the new communications backbone so it would survive years of such conditions. The poles they chose were sometimes steel or manuka trunks but the most effective poles, in the North Island at least, were kauri.

The west of the North Island through the rugged King Country to Waikato with its dense bushland would have been a considerable challenge. Even the hardened labourers, who were used to digging holes, hoisting up poles through a system of pulleys drawn by horses, and easing out huge lengths of wires from large wooden rolls would have found it hard going. Besides the natural obstacles of weather and wilderness there was always the risk of fierce resistance from local Maori, many of whom resented the intrusion of Pakeha extending this strange arrangement of poles across their tribal land. Some had already engaged in running battles with the British troops and others were fiercely suspicious of any intruders after being forced off their prime Waikato land by government forces.

On the East Coast, however, cable laying proceeded rapidly, reaching from Masterton to Napier by 1868, although it would be a further four years before it reached Auckland. The telegraph poles were placed as close to the Wairarapa coastline as possible to avoid the dense bush. Once it had reached Hawke's Bay, it was slowly extended from Napier to Rotorua and Taupo and on to Thames where it met the Auckland line, now extending from Mercer.

During the New Zealand wars, telegraph lines were often first installed for military purposes enabling the troops to maintain communication. A huge investment was made in ensuring these lines straddled the main routes throughout the late 19th century. Within 10 years of the first telegraph line being established, more than 2000 miles of phone cable had been strung across the country. By 1872 when the Wellington-Auckland line was completed, around 400,000 messages a year were being carried over the fledgling network; in the following decade the length of installed lines had doubled and 1.5 million telegrams were being handled annually.[13]

Official post offices and agencies would send and receive telegrams on behalf of customers. When a telegram arrived couriers or 'telegraph boys' would deliver handwritten or printed messages to the appropriate residence or business. If someone wanted to reply to a message or to initiate communication, it involved visiting an agency, writing your message on a pre-printed form and having a telegraph operator key it in and transmit it to the desired location. You would be charged by character and distance, which forced smart communicators to create 'telegraphese' shorthand, the precursor to 21st century text messaging.[14]

The world was in the midst of the industrial revolution, moving rapidly into the age of steam and steel and spurred on by breakthroughs in electrical power and telegraphic communications. While

the industrialised nations were facing a period of rapid growth driven by engineering, innovation, and investment, New Zealand was beginning to feel left out. From a British standpoint we were often seen as an annoyance, with our constant cries for greater support from the home country; too easily lumped in with the convict hordes across the Tasman or dismissed as irrelevant to the grander plans of the Empire.

From 1860 there was no shortage of proposals from entrepreneurs and investors who claimed they could broker undersea cable deals to link New Zealand to the world. Major projects were already underway to link Britain with its colonies in India, Singapore, and China. Entrepreneurial local-body politician and newspaper baron Julius Vogel had long articulated his desire for New Zealand to have direct international communications and an improved infrastructure. Communications were limited, roading was poor, railways were in their infancy, and telegraph poles still provided limited coverage of the nation.

Vogel warned the country was heading for recession. Investment was down, the gold rush was all but over, there were fewer immigrants and with prices for wool and wheat falling and business growth flat he believed it was time to act. Vogel had introduced a motion in parliament when he approved the Cook Strait cable in 1864, when he had first spoken of the importance of a cable to Australia. He raised the issue again in 1868 and in 1869, when he was appointed colonial treasurer, postmaster general, and commissioner of customs, and in a position to put into practice the large and imaginative schemes that provincial politics had not allowed.

UNDERSEA AND FAR AWAY

Vogel began talking with key people in Australia about ways to achieve a trans-Tasman undersea link. Confident he had support, he put forward a bill at the 1870 parliamentary session which supported his new economic policy. The bill was passed into law by a slim majority and a memorandum of understanding with Australia on 6 January 1870 committed the New Zealand Government to £15,000 annually towards the cost of the cable. In his dramatic financial statement of 28 June 1870, Vogel announced he would borrow £10 million over ten years for the development of railways and roads and improvements to national and international communications – along with immigration schemes for long-term settlers and short-term workers. The undersea cable to Australia would be part of this new package. The money would be borrowed on overseas markets at five and a half percent interest, with repayments made from railway revenue and stamp duty. Six million acres of land alongside the railways would be used as collateral for the loans.

He left on a loan-raising visit to England and the United States at the end of 1870 and, after borrowing £1.2 million, granted railway and immigration contracts.[15] Then the British backed off their commitment to the trans-Tasman cable, and without government guarantees, the private investors also walked away.

By 1872 there was already a link from the eastern tip of Java to Darwin in Australia. It had been laid by the newly formed British Australian Telegraph Company in association with the South Australian Government, which had already constructed a 3000km telegraph line from Darwin to Adelaide. This had given the Australians a direct link to London through a mix of undersea and overland cables and significantly improved the time it took for short messages to reach New Zealand, even if they had to go the final leg by ship. If you wanted to send an international telegram it would first have to be mailed then sent to Melbourne or Sydney by ship then re-keyed to the more distant location by cable.

While New Zealand's hopes for closer communications had initially been dashed, there were other offers. Siemens Brothers had laid cable from India to Singapore and were keen to extend into

Australia and New Zealand. Parliament looked at a proposal in 1873 and agreed, in conjunction with Australia and Singapore, to subsidise such a cable to the tune of £17,000 a year over 35 years. There would be a separate line to Britain in competition with what was now known as Eastern Extension Australasia and China Telegraph Company. The agreement was signed but within months Siemens changed its route and wanted to land the cable at North Cape. Vogel refused, and by the time the bill to approve the deal came to parliament, there were serious doubts about whether it was financially viable or in New Zealand's interests. The go-ahead was given anyway but resolving the details dragged on for another year.

In England Vogel met with Siemens and became increasingly uneasy about the company's ability to finance the proposed cable. Word came in June that he had been working on a better offer and was about to sign an agreement with Eastern Extension, formed in 1873 from the liquidated assets of several other cable companies. The partnership, involving both the Australian and New Zealand Governments, would see Eastern Extension lay and operate a cable to New Zealand from Botany Bay in Sydney, near the monument to French explorer Jean-Francois de Le Perouse. New Zealand would pay only £5000 a year. Because the Cook Strait cable was proving far from reliable, it was clear the termination point would have to be in the South Island. It was eventually agreed that it would be in Nelson, New Zealand's fifth largest township, which at the time had a population of 5000. The specific location was narrowed down to a sheltered deep water inlet known as Schroder's Mistake, later renamed Cable Bay.

Work began immediately on building a terminal office and placing 24km of telegraph poles and wire from the inlet to the Nelson Telegraph Office. The cable ships were sighted off Nelson on Wednesday 16 February 1876. Government officials had been waiting for days for this. A cry of 'three cheers for the cable!' went up from a boatload of tourists. The locals were excited the final link, connecting New Zealand into the growing global telegraphic network, was about to be put in place. A short while later, as smaller boats tried to bring the cable ashore at about 2.30 p.m., Hemi Matenga, a local Maori from Wakapuaka Pa, stepped into the water and waded up to his neck to grab the cable and bring it to shore.[16]

The first message, sent by Julius Vogel on 19 February, went to the Earl of Carnarvon, Britain's colonial secretary. Over the next three days congratulatory telegrams poured in from various colonial governments. The duplex link between La Perouse in Sydney and the Wakapuaka (Cable Bay) terminal house at Nelson was officially opened for business on 21 February 1876, by default giving New Zealand a direct link-up across Asia, Europe, and Britain. On the first day of business 54 inward telegrams were received and 93 sent. The benefits of an arrangement with United Press Association, which had a permanent agent stationed at Cable Bay, were evident the next day as direct cable news began appearing in New Zealand newspapers.

The local community was in a celebratory mood. The cable ships *Hibernia* and *Edinburgh* dropped anchor at the Port of Nelson. As the evening drew on the ships turned on all their lights and put on a rocket display, followed by a 17-gun salute from the Nelson Artillery volunteers. Various celebrations, excursions, picnics, and a ball were arranged. On the Sunday before the ships left, a large congregation gathered at the Anglican Cathedral to hear Bishop Suter give a sermon based on the Book of Job, quoting chapter 38, verse 35: "Canst thou send lightnings, that they may go, and say unto thee, Here we are."[17]

Morse was still in its early development and telegraph networks were capable of sending only one message at a time. When the line cleared, a response could be sent in the familiar audible tones of dots and dashes which coded the alphabet. Repeaters were needed every 1100km so the trans-Tasman cable presented some challenges. The Mirror Galvanometer[18] was deployed to translate the dots and dashes into light flashes. Two operators were required at either end, one to call out the messages letter

by letter, the other to write them down. It often took an operator two years of training; 30 words a minute was acceptable, although 60 words was preferable in a senior operator.[19]

Sending and receiving telegraphs remained a multi-phased process. When a message arrived from Australia across the cable there was no direct link to the landlines, so the operators at Cable Bay would have to re-key the messages on for the next leg of the journey over the newly completed landline to the Nelson Telegraph office.[20]

MAKE WAY FOR THE TELEPHONE

The great time lag between what was happening in the rest of the world and the new colony in New Zealand was disappearing. New Zealand's population had grown rapidly from 27,000 in 1851 to 227,000 by 1871 and would treble over the following decade. The rapid expansion of railways and roads and the number of steamships plying trade along the coastline meant goods were moving more quickly to and from their destinations. New Zealand was beginning to show its true capabilities. The British were finally taking notice of the growing volumes of meat and wool, which were helping transform the country from a thorn in the side of the Empire into a farm supplying quality agricultural products – particularly after the first frozen-meat shipment arrived in 1882.

With the telegraph now available in most centres businesses and individuals were now far more informed about what was going on in the world, the nation, and their own communities. Around 7000km of internal telegraph lines were now in operation. Even though the New Zealand Telegraph Department was training up a growing number of telecommunications operators to send and decode Morse messages, the old-style telegraph was rapidly heading for obsolescence. A new challenge was presenting itself requiring that infrastructure to move up a notch or two.

The first telephones in New Zealand were deployed in 1876, just a year after their invention.[21] In 1877 a Dunedin electrician, Charles A. Henry, organised the first 'talking telegraph' trial after putting together a telephone receiver and transmitter (a transceiver) based on what he had read in a magazine. According to the *Otago Daily Times* a "telephone instrument and wire" was attached to the existing telegraph wire at the Dunedin Telegraph office and another at the Milton office – a distance of 57km. The newspaper described it as "simply marvellous." It wrote "A large number of questions were asked and each was replied to instantaneously by the person in Milton… Not only could the words spoken at either end be clearly heard, but the difference in tone of voice was easily distinguished."[22]

Later that year the first telephone line was installed between Kaiapoi and Addington and the first call on a private line, using the newfangled talking telegraph, was allegedly made by a Mrs Sheehy, who took a call from a Roxburgh farm in central Otago. No one thought to keep a record of what she said.[23] The first commercial telephone service went into operation in 1878 in Christchurch, and the first telephone office was established in Port Chalmers the following year, with a link to Portobello so shipping information

Pole position. The pioneering efforts of hardy characters such as these linemen at Waiau in 1905, cutting through rough terrain to erect poles and wires for our earliest communications services, helped give New Zealand a sense of nationhood. Telecom Archive.

could be relayed to Dunedin more quickly. Telephones soon began to be used to supplement the telegraph in small towns that couldn't afford Morse operators.

Overhead telephone cables began appearing across the nation, spanning out to connect directly with businesses, government offices, and homes. The proliferation of poles and the wires hanging from them were often referred to as 'Lemon trees' after the director of telegraphy, Dr Lemon. Among the industries transformed by the new communications lines was the newspaper business. Before the advent of phone connections they had to rely on sailing ships to deliver news from abroad and in Auckland reporters often rowed out on the Waitemata Harbour to meet vessels to pass this on to the public.[24]

Lemon had produced a scientific paper in October 1874 on duplex telegraphy, based largely on an earlier paper by R. S. Culley, to the Society of Telegraph Engineers in London. It included his department's experiments in 'duplexing' the Cook Strait cable in 1873–1874. When the duplex system extended to most of the main circuits, providing an extra 2378km of wires at an 'absolute saving' of £20,000 a year, Lemon's department was claiming New Zealand "...was the first colony on this side of the Line which has introduced and worked with success this improved system of telegraphy... It was only fair to Dr Lemon to again express an indebtedness to the colony to him for his persevering and untiring efforts in introducing to his Department every new and improved system."[25]

The Electric Telegraph Department had for 18 years been separate from the Post Office, although its commissioner was also postmaster general and many of its 'telegraph-masters' were postmasters. The goal to take over all the various telegraph networks was progressing apace; by 1879 only 19 of the 214 telegraph stations were still operating independently. It wasn't all smooth sailing. Sometimes the workers felt their employers were taking advantage of them. On 3 January operators at the Electric Telegraph Department went on a nationwide strike because they had their overtime allowances cut and the working day lengthened by one and a half hours. The strike was broken by 8 January with the men forced to sign an apology for striking and being fined as well as losing their pay for the days off.[26]

In 1881 when it was clear the telephone was about to transform the communications landscape, the New Zealand Post and Telegraph Department replaced the Telegraph Department. It quickly became a state monopoly, on the advice of a government official, in order to prevent the Electric Telegraph Company of Chicago, a direct antecedent of Ameritech and Bell Atlantic, opening an exchange here. There had also been an attempt by Auckland businessman H. B. Morton to start a private telephone company for the Edison, Bell Co. Horton had run an early telephone trial using an Auckland gas company private wire, which was shut down by the government.

However Postmaster General Lemon, at his retirement ceremony, observed that telephony became a state monopoly 'by accident' when a Melbourne entrepreneur, a representative of the Melbourne Telephone Exchange Company, indicated he wanted to start a telephone service in New Zealand around 1878–1879. The prospect of someone else establishing themselves in Lemon's patch disturbed him and he began looking at bringing it under state control. He claims to have approached the commissioner of Telegraphs, John Hall, to put a clause in the 1880 amendment of the 1875 Electric Telegraph Act "to give the Colony the sole right of using the telephone."[27] The resulting clause read:

"It shall not be lawful for any person to erect, construct, establish or maintain for hire or profit any line or electric communication by telephone, except the sanction of the Governor be first obtained for that purpose."[28]

Thereafter the Telegraph Department took full responsibility for developing a nationwide telephone network and training operators to handle calls at the new manual exchanges about to be deployed across the country. Female exchange operators were employed to sit in rows at

switchboards, connecting calls by inserting a plug into the socket relating to the number called.

The first manual telephone exchanges with battery-operated transmitter went into operation in Christchurch in 1881 with 27 subscribers and Auckland with 26 subscribers. Dunedin followed in 1882 and Wellington in 1883. There was some initial resistance to the rapid roll-out of this replacement technology. Even though exchanges opened in most major centres over the next decade, there were still only 2000 subscribers by 1890. By the turn of the century, however, there were 7150 subscribers throughout New Zealand and toll lines began linking cities by 1906.[29]

BATTLE OF TWO CABLE BAYS

There was ongoing pressure from the 1880s to reduce the cost of transmitting telegrams, particularly between New Zealand and Britain, but even fierce competition between two cable companies could not hold back the tide of change.

While business increasingly depended on telegrams to communicate with local and international suppliers and customers, the cost was greater than most individuals could afford. In 1884 the government, primarily influenced by Jules Vogel, threatened to withhold any future subsidies of the Eastern Extension cable between Nelson and Sydney unless there was a significant drop in the rates.

A cable to England cost five pounds two shillings, and nine pence. Despite opposition Vogel stuck to his guns, knowing that Canadian Sanford Fleming was proposing a Pacific cable from Australia and New Zealand to Britain via Canada, which he claimed would reduce the New Zealand-Britain rate to just two pounds.

The threat was not taken lightly by John Pender, who in 1872 had merged four companies into the Eastern Telegraph Company, and a year later added another three acquisitions to the Eastern Extension Australasia and China Telegraph Company with common board membership. He was livid: if no subsidy was forthcoming for his trans-Tasman leg of the cable, and if New Zealand wouldn't renew its contract, the rates would be raised to ten shillings for ten words, and one shilling for every additional word.

The New South Wales postmaster general tried to convince Vogel, a staunch anti-monopolist, to sort out the mess. This was further complicated when word got out about Eastern's proposed increase; Chambers of Commerce delegations from across the country met with Vogel, imploring him to renew the subsidy. There was grandstanding on both sides until things reached a stalemate with Pender holding off the increase and Vogel referring the decision to the next parliamentary session, six months away. Pender withdrew his threats, only slightly increasing his rates. Meanwhile Vogel continued to investigate how quickly it would take to get a new cable into New Zealand.

Fleming continued laying cable across Canada, extending his comprehensive proposals for a Pacific cable via Hawaii and Fiji and on to Australia and New Zealand, with a promise to halve telegraph rates. He suggested New Zealand's involvement might only be £4000 a year for 25 years. There was little news of his plan for a time, then it resurfaced.

Eastern Extension, which now owned and operated half of the world's 32,000km of undersea cables, lobbied against the Pacific cable wherever possible. It had added a second cable from La Perouse in Sydney on 26 April 1890, landing at Cable Bay, Nelson. The ten-day cable-laying marathon attempted to provide redundancy and ward off the competitive threat. Fleming forged ahead regardless, deciding the Australia-New Zealand portion of his Pacific cable would link from Queensland's Gold Coast to Doubtless Bay in the Far North of New Zealand.

The actual site within the wide mouth of Doubtless Bay would be known as Cable Bay, like its South Island equivalent. A building for terminating equipment and housing operators was built, along with a staff residence. From Cable Bay the overland telegraph ran to the New Zealand Post and Telegraph at Whangarei and on to Auckland, a distance of about 320km.

Sir Joseph Ward, the former post office message boy and, from 1890, postmaster general and electric telegraph commissioner, sent the first two telegraphs from ship to shore from the cable ship *Anglia* for transmission to his wife and to Premier Richard Seddon in Wellington. When the Cable Bay station became operational on 26 March 1901, Ward personally sent the first message to Colonial Secretary Sir Joseph Chamberlain in London. The trans-Tasman alternative to the Eastern Extension line became fully operational in December that year when the New Zealand-London word rate was three shillings. Anticipating a price war Eastern Extension had previously lowered its rate from five shillings and tuppence to three and fourpence and was now forced to equal the rate of its new rival. Competition was working.

However, the second cable remained controversial. Eastern Extension's revenues from its Nelson-based station dropped dramatically as the government aggressively supported its investment in the Pacific Cable Board, despite promising not to actively undermine its competitors. In fact, the New Zealand public cared little about which cable carried their messages, as long as they arrived. After all, the visible entity they were dealing with was New Zealand Post & Telegraph (NZP&T).

A population swing away from the South Island to Wellington and Auckland brought greater focus on the Cable Bay terminal in Northland. Eastern Extension began a marketing campaign to strengthen support from businesses, even printing its own forms. However NZP&T refused to accept the forms because the company did not have its own cable distribution centre. So Eastern employed a canvasser based in Wellington. It soon became clear it was up against an entrenched attitude; the Ward government favoured government ownership of all telecommunications cable.

Staff numbers at Nelson declined, the relationship with Associated Press deteriorated, and ongoing tensions with NZP&T were making life difficult all around. Eastern was also having difficulty maintaining and keeping its lines in optimal order. The Pacific Cable Board was having troubles of its own setting priorities for transmissions. Some of its trans-Canadian traffic went across a leased line which used a different operating system, adding to the error rate. A separate line was then installed.

By 1911 businesses had become so dependent on sending and receiving telegrams that speed of delivery was now a major factor. The bulk of traffic was going to New South Wales and Victoria but the Pacific cable route from Doubtless Bay via Norfolk Island to Southport then Brisbane and Sydney was time-consuming and losing it business. The Pacific Cable Board moved its offices to Auckland, taking the Doubtless Bay cable end with it, re-splicing it at Auckland's Takapuna Beach. It installed repeaters at Norfolk Island so messages went direct from Auckland to Suva. A new cable was also laid at Muriwai Beach on Auckland's west coast, running directly to Bondi Beach in Sydney. The new cables no longer needed operators, as messages could be transmitted automatically between post offices. Pacific Cable quickly picked up a greater share of the trans-Tasman business.

Meanwhile NZP&T had struck an agreement with Eastern in 1909 to do all its landline work, and the company was considering plans to shift its operation to Wellington. Business had slowed, rates were going down and from 1913 there was heavy discounting, particularly at weekends. Both companies could only ignore the impending competition from wireless for so long.

Wireless relay stations were established on top of the Auckland and Wellington post office buildings and coastal stations were established in Northland and Southland, principally for ship-to-shore communications and access to the Pacific Islands. However businesses were also starting to use the wireless system for urgent messages. NZP&T had agreed to start receiving its first 'Marconigrams' from 1906, which made their way here through a series of undersea and landline cables and wireless links including ship-to-shore communications.

In 1914 at the outbreak of World War I, the Germans attacked the isolated but pivotal stations of the Eastern Extension network at Fanning and Cocos Islands (later Keeling Island). A major fire

had severely damaged the Cable Bay station on 1 June, giving further incentive to move offices to Wellington. In late 1915 Eastern's two trans-Tasman cables were re-routed to Titahi Bay, 22km north of Wellington, with underground cables running to the new premises in central Wellington. In Australia the cables were moved from La Perouse to Bondi.

While the cables of both Eastern Extension and Pacific Cable had been invaluable for government and military communications between New Zealand and its allies, particularly in relation to wartime activity in the Pacific Islands, business had slowed and consequently international communications had tailed off. There was modest communications growth after the war but produce markets remained in a slump.

The poor state of the cables now became evident. Their lack of capacity meant business communication often depended on which company was able to take the traffic. Costs were cut to try to keep the business attractive, and the Pacific Cable Board moved rapidly to increase its capacity, laying duplicate cable between Suva and Auckland in 1923. Eastern also began to apply new regeneration technology to boost the signal over its cables. But even with these improvements cable was still too costly for the average New Zealander and the main traffic continued to come from government, business, and the newspaper industry.

The wireless threat again came to the fore, and by the end of July 1924 the British Government was in discussion with the Marconi company for a system in Canada, with options for routes to South Africa, India, Australia, and New Zealand. Both Eastern and Pacific Cable lowered their rates in anticipation and Marconi undercut them significantly. Eastern and Pacific Cable dropped its word rate between Britain and Australia even further to two shillings. Marconi came back with a flat four penny rate. It was all over. Within months wireless had taken 65 percent of all Eastern Extension's business and more than 50 percent of Pacific Cable's.[30]

In 1927 Eastern sought British Government assistance to keep afloat, threatening to cease operation unless it got financial help. Marconi was incensed at what it claimed must ultimately result in state control. What resulted was a merger of interests, with Eastern Extension effectively absorbed in a new entity that became known as Cable & Wireless.[31]

As telegraph costs moved within the reach of the general public the world entered another period of turmoil. Hot on the heels of the New York Stock Market crash of 1929, which triggered the Great Depression, New Zealand's economy rapidly contracted. In May 1932 the Titahi Bay cable was lifted and re-landed at Muriwai Beach. A year later Eastern closed its offices in Wellington.[32]

WIRELESS OPTIONS ABOUND

In 1894, a year before Marconi's first successful wireless transmission in Europe, Ernest Rutherford, a physics graduate at Canterbury University College, transmitted a signal 18 metres across the physics department through several walls using Hertzian waves. The following year Rutherford, who became the father of nuclear physics, took his apparatus to the Cavendish Laboratory at Cambridge University, where he further developed it to pick up signals transmitted up to 800 metres away. By then other aspects of physics had become more attractive to Rutherford, who in effect left the future development of two-way wireless to Guglielmo Marconi.

In New Zealand, two Dunedin student teachers, L. E. Strachan and C. R. Scott, had managed to repeat Heinrich Hertz's original 1888 experiments. In the Christmas holidays of 1900–1901 they successfully transmitted a spark from one room to another. By the middle of the year the two could transmit a signal that rang an electric bell 90 metres away. The next year J. L. Passmore, a Dunedin teenager, built a wireless telegraph from instructions in a magazine. By 1903 the 18-year-old could send a signal up to 10km, by which time any further experimentation may well have incurred the

wrath of the government, which now had full control over any developments that might be termed wireless telephony.[33]

The New Zealand Government had been keeping a close eye on the new technologies that were beginning to open up communications both nationally and with the outside world. Early attempts at demonstrating wireless broadcasting had further sparked fears about foreign telephone companies entering the market.

The Wireless Telegraphy Act 1903 clearly stated that only the government was permitted to receive or transmit wireless communications. The new legislation, which passed into law on 26 September 1903, sought to protect the government's investment in the telegraph and telephone networks and secure its rights to manage radio spectrum to prevent interference. "The Government intend to acquire a monopoly of this system (wireless), just in the same way as has been done in regard to telegraph lines and telephones," announced the attorney general to the Legislative Council. It was a world first, a year ahead of the equivalent legislation in the United Kingdom and two years ahead of Australia and Canada. Anyone involved in unauthorised wireless telegraphy was subject to a £500 fine and confiscation of equipment.

One of the main concerns, as outlined by the postmaster general of the day, was that the new wireless telegraphy technology might render the wired telegraphy network obsolete and thereby deprive the government of revenue.[34] The Seddon Liberal Government's monopoly actions were defended by claims that the Act would help preserve the confidentiality of telegrams or other messages which might be transmitted by the Post Office through the new system. The Legislative Council wanted control only over those stations that operated for profit but Premier Richard Seddon claimed he had Britain's support, for his concerns that foreign powers might establish radio stations in New Zealand for seditious purposes.

The Act was far reaching and covered:

"... receiving and transmitting messages by what is commonly known as 'wireless telegraphy,' including in that expression every method of transmitting messages by electricity otherwise than by wires, whether such method is in use at the time of the passing of this Act or is hereafter discovered or applied."[35]

The first domestic radio transmission was made by the Marconi Company at the 1906 Christchurch International Exhibition. The first trans-Tasman transmission was made from *HMS Pioneer* in Wellington Harbour via *HMS Powerful* in the Tasman Sea to *HMS Psyche* in Sydney Harbour on 3 February 1908. In 1908 three Dunedin teenagers, two of them pupils at Otago Boys' High School, gave the country's first public demonstration of wireless telegraphy. Stanton Hicks, Rawson Stark, and Cyril Brandon transmitted messages from the mayor of Dunedin and the mayor of West Harbour between Anderson's Bay and Ravensbourne. The boys also sent a message, relayed by land telegraph to parliament, "on behalf of the boys attending the schools in the Dominion, the S.H. & B. Wireless Company send hearty good wishes to the Postmaster General and the Parliament of New Zealand." Nearly two decades later, in October 1924, an English schoolboy sent a Morse transmission from Mill Hill School in London. It was received at Shag Valley Station by Frank Bell – his reply completed the first round-the-world radio communication without the use of relay stations.[36]

The frequency of early radio transmitters and receivers could not be controlled to any significant degree, so only one wireless communication at a time could take place in any given geographical area. With the tragic loss of the *Titanic* in 1912, it was realised a management framework for radio transmission and reception was necessary for the full potential of the technology to be used. Although the upper range of frequencies suitable for wireless communication was unknown,

MUSIC TO OUR EARS

In 1921 a Wellington businessman, Charles Forrest, began transmitting gramophone recordings from a room in the Hope Gibbons building. Although he had no formal permit or licence he had a verbal understanding with the chief telegraph engineer that if his transmissions were causing reception problems at the nearby marine radio station, he would cease until the ship-to-shore communication was concluded.[38]

New Zealand's first broadcast concert was transmitted from the physics laboratories of Otago University on 17 November 1921 by Professor Robert Jack. He transmitted the first of a series of concerts that included live music and gramophone recordings, heard as far afield as Auckland. He had told the *Otago Daily Times* in August 1921:

"Wireless telephony will develop rapidly along its own special lines and will tend greatly to strengthen the bonds by which a civilised community is held together and formed into an organised whole. It will give wider publicity to all news of public interest, to speeches and entertainments and will thus tend to bring country settlers into close touch with the life of the town…the life of each community will be broadened and educated by being brought into more effective touch with the life of the whole world. No country stands to benefit more than New Zealand by having the disadvantage of isolation removed."

Jack, who had had been working on radio at the university since before World War I, suggested that in the future all radio stations would be equipped with radio loudspeakers, so that people could attend a radio concert in the same way that they went to the theatre. His broadcast was finally allowed after a long battle with an unsympathetic Post Office bureaucracy. In 1920 the university authorised him to buy the basic gear, mostly war surplus equipment, to build a transmitter. By April 1921 he had it working well enough to be granted a provisional radio permit by the Post Office, with one ridiculous proviso: they had permission to receive but not to send.

He envisioned monthly concerts where New Zealanders could hear the best of what was available. However the Post Office feared such transmissions might interfere with communications between shipping. He eventually persuaded the Post Office that the distance between his transmitter and those used by shipping at Invercargill was safe for experimentation and was eventually given a permit but had to reapply, submitting his programme for approval, each time he planned to broadcast. In 1922 Jack founded the Otago Radio Association, which became known as 4XD. Refusing to be absorbed into the state system, it lived on to become the oldest broadcasting station in the Commonwealth and among the oldest in the world.

In 1923 the first regulations governing broadcasting were imposed. Anyone planning to become a broadcaster needed to be of good character, include religious material for at least three hours on Sundays and restrict content to "an educative or entertainment character such as news, lectures, useful information, religious services, musical or elocutionary entertainment and items of general interest that might be approved by the Minister from time to time." Advertising was unthinkable and controversy was banned.[39]

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In July 1922 a radio station launched in Wellington that was licensed to operate on a wavelength of 275 metres (1000kHz). The operators were even invited by the P&T to broadcast the 1922 election results. In 1923 the government decided to promote private broadcasting and regulations were introduced that divided the country into regions, specified frequencies and transmitter powers, and banned advertising. The first station licensed under the new regulations was 1YA in Auckland. A licence, costing five shillings, was required to receive broadcast transmissions, and applicants had to supply a character reference and proof of British nationality.[40]

Private broadcast stations flourished during the 1920s and 1930s. However the Broadcasting Act 1936 established state broadcasting under a new government department, the National Broadcasting Service (NBS). By the beginning of World War II all but two of the private stations had been bought by the government. Radio, and eventually television, broadcasting was largely to be the preserve of the government for many years to come.

the concept gradually emerged of the radio spectrum as a public and economic resource, and licensing (the generation of radio waves) as a management tool for the prevention of radio interference.[37]

The dots and dashes must get through. Telegraph boy, 1952.
Photo: Ferrymead P&T Society

TALKING TO OURSELVES

During New Zealand's formative century governments financed roads and streets, rail networks, universities, schools, a national airline, a health system, banking, postal, and broadcasting networks and established electricity and telephone connections to every home. From the early 1900s technology advanced rapidly, the telephone becoming an important part of the social fabric. The country was becoming more accessible. The main trunk railway between Auckland and Wellington was completed by 1908 and roads into towns and remote communities were improving all the time. Local electricity generation meant street lights and electric trams were now operating in some locations. Telegrams were still used for international communications and special occasions but the telephone network was now touching the lives of most New Zealanders. The first telephones were wall mounted and available only in black. In 1915 the candlestick telephone was introduced.

Phones were supplied by and remained the property of the carrier, a situation that remained in place until deregulation in the 1980s.

A faster, more efficient approach to the telephone exchange had been invented in 1891 by undertaker Almon B. Strowger. He had been wondering why his business in Kansas, United States, was not doing as well as it had been while his rival seemed to be doing a booming trade. Strowger tracked down the problem to an operator at the telephone switchboard who happened to be the wife of his rival. She was switching calls to her husband's business regardless of which undertaker people requested. Determined to find a solution that prevented this kind of bias, Strowger built an automated switchboard.[41]

In 1912 the New Zealand Government passed a Country Telecommunications Act, which enabled people in rural areas to build their own telephone networks and link into the public network. The first automatic exchange equipment came into operation in Auckland and Wellington that year, as a supplement to the manual exchange in each centre. The first town to have an all-automatic telephone system was Masterton, in 1919.[42] The new exchanges enabled the NZPO to increase its traffic volume to handle 500 lines at a time. The first private automatic branch exchanges (PABX) appeared in 1925.

A relatively unreliable telegraph cable had linked the North and South Islands since 1864, but in 1926 the first Cook Strait cable dedicated to telephony was laid. The new 'carrier' approach to telephony (frequency division multiplexing), introduced in 1929, made it possible to transmit a number of voices over a single pair of telephone wires by using different frequencies. This resulted in great improvement in the capacity of the lines and the quality of calls, particularly over long distances. By 1927 a transatlantic telephone service was in operation.[43]

TALKING TO THE WORLD

By 1930 all the main centres were part of a national telephone network through PABX, and callers could pay a toll to call to connect between cities and towns. The NZPO had around 125,000 subscribers. Table telephones became popular and were available in a variety of styles, sparking a fashion in phones. The square, black bakelite, however, remained the standard phone until the late 1950s.

It was official: the telephone was here to stay. People were talking, not just across the back fence, but to friends, relatives, neighbourhoods, and communities. Remote farms and townships once cut off from the commercial centres were now part of the social fabric. Businesses in towns and cities were more closely tied to their suppliers and larger customers. World news was more readily available, orders filled more promptly, requests received instantly. Gossip travelled at light speed.

In 1930 the first international public radio-telephone service linking New Zealand's phone network to that of Australia was in place. The first international call was made from Kirkcaldie & Staines in Wellington on 25 November 1930, when the minister of native affairs, Sir Apirana Ngata, rang the acting prime minister of Australia, Mr Fenton.

The media of the day reported:

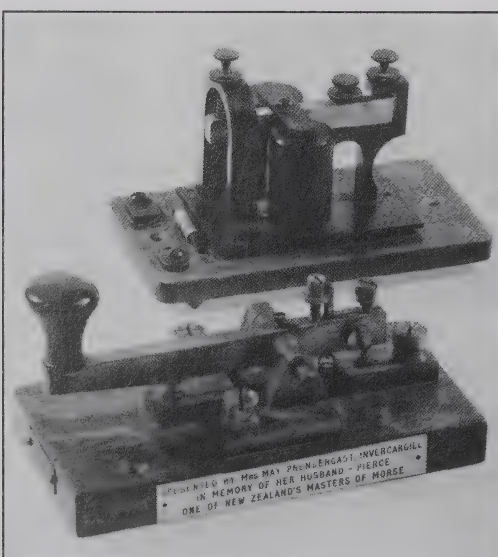
> *"Weirdly, out of the ocean wastes that separate the two isolated outposts of the Empire, came voices from Australia reaching to the heart of Wellington, when the Trans-Tasman radio telephone service was officially launched. The voices swelling into harness across 1,200 miles, were answered by other voices in a means of conversation won by another marvelous development in radio communication.*

The success of the system revealed to the listeners a valuable avenue for trade, commerce, social amenities and international understanding, distance was annihilated and the ocean spanned in a breath.

Sir Apirana Ngata opened the conversation with a Maori greeting and in what he described as the "first official communication over the air between the two countries," offered Mr Fenton greetings from New Zealand and raised with Mr Fenton the possibility of a visit by the Prime Minister Mr Forbes, who was at the time in London.

Shortly after two business calls were sent to Sydney and six people from Australia rang friends in New Zealand. The official ceremony was attended by representatives of the Wellington business community, senior executives of Amalgamated Wireless, the Bank of New Zealand, the Wellington Chamber of Commerce, the Bank of New South Wales, the Bank of Australia, the Union Steam Shipping Company…."[44]

The radio equipment used by the service was installed by Amalgamated Wireless Australasia (AWA) and the charge for using the radio telephone service was £1 per minute. In July 1931 the network was extended to the United Kingdom using Australian beam wireless stations, which had been opened in 1927 by AWA. The company was an electrical conglomerate with interests extending from radio receiver manufacture to the operation of commercial broadcasting stations. The two stations were primarily concerned with radiotelegraph traffic.[45] A call between Australia and New Zealand cost £6, 15 shillings and was regarded as something of a luxury. In the first year of the trans-Tasman link 312 radio telephone calls were made to and from New Zealand. By 1939 when rates had fallen 3457 calls were recorded.[46] That year New Zealand had more phones per head of population than any country except the United States.



Telegraph key and sounder used to tap out messages in Morse Code.
Photo: Ferrymead P&T Society

Coin-operated telephones were first tried experimentally in Wellington in 1910 for local calls. Multi-coin slot telephones, from which local and toll calls could be made or telegrams phoned in for onward transmission, were first installed in 1938 in Christchurch. Annual rentals for residential telephones ranged from £12 for very small exchanges up to £16 for the main centres. Business telephone rentals ranged from £18 to £31. Party lines were charged much lower rentals.[47]

At the Commonwealth Telecommunications Conference in London in 1945, the New Zealand Government signed an agreement to take over responsibility for external communications. The assets of Cable and Wireless were purchased and the NZPO became responsible for external as well as internal telecommunications services.[48] Phone customers had nearly tripled to 348,539 by 1950 and by 1960 the number of subscribers was 686,021. The sheer pressure

of customer demand forced the Post Office to make every attempt to keep pace with the technology that was at the forefront of this revolution.

Updating the vote. Wellington Telegraph Operating Room at the Central Post Office on election night, 1951. Photo: Ferrymead P&T Society

TOWING THE PARTY LINE

By 1959 what was called a 'telecommunications motorway' had been established by the Post Office for long-distance calls, initially carrying just 600 circuits between Wellington and Auckland and forming the base for modern-day networks. Some countries were charging for local calls but New Zealand offered a flat fee for unrestricted calling within the local exchange area and toll fees for calls to other exchange areas. At the turn of the century calls from one exchange to another could be made only if the distance was short and circuits weren't needed for telegraph traffic.

Although automatic exchanges were starting to make inroads, operators at manual switchboard exchanges; which still served the majority of the country, were hard pressed to keep up. Callers would first have to call the exchange with a couple of rugged rings, wait for an operator to answer, give them the number they were trying to reach, and then wait for an answer from the called party. The called party would have to identify calls meant for them, as opposed to others sharing the party line, through a Morse-style series of long and short rings. This was often confusing, particularly when several people answered the phone at once or listened in on each other's conversations. In 1960 there were 55,227 party lines serving a total of 173,139 'subscribers' stations.'[49]

The growing local and global network now included a mixture of voice, Morse code, telegraphs, and newer teleprinters, the precursor to the modern fax machine. Facsimile services were introduced in Australia and New Zealand in the late 1920s, using the Siemens-Karolus picturegram system. Images were of low quality and transmission was slow and expensive. Most of the traffic was for low-resolution reproduction of photographs and cartoons in newspapers. Machine-printing telegraph equipment, which promised reduced costs, was used from 1921. New Zealand-designed multiplex telegraphy printing equipment, which could handle four messages simultaneously in each direction on each circuit, came into use between Wellington and Christchurch in 1921. This system remained active for 30 years, but was rapidly sidelined by faster imported teleprinters from about 1929.[50]

Toll services were further improved in 1960 by the new large-capacity toll link between Auckland and Wellington. Coaxial cable was used from Auckland to Hamilton and from Wellington to Palmerston North, with microwave channels between Hamilton and Palmerston North.[51] From 1930 until 1962 overseas telephone services used high-frequency radio. A government short-wave radio-telegraph link was established with Apia in 1927 and extended to Rarotonga in 1930. The first high-speed radiotelegraph service to the United States launched in 1942. In 1947 a radiophoto service was opened with Australia and England. Telegraph services by radio were established to London in 1952, to Sydney in 1954 and to Vancouver-Montreal in 1959, and an international telex service opened in 1960.

Telex operator Mrs Ann Hawkins of Cory Wright & Salmon, 1964.
Photo: Ferrymead P&T Society.

As the number of subscribers continued to escalate so did toll traffic. In 1900, 260,000 toll calls were made; by 1920 this had reached 6.75 million. By 1940 there were 16 million calls and in 1960 subscribers made 55 million toll calls. By 1962 there were four channels to Australia and one each to Britain, Canada, the United States, and Fiji. Service was restricted, except to Australia. The first link of COMPAC, the Commonwealth Pacific telephone cable owned by Britain, Canada, Australia, and New Zealand, was laid between Sydney and Auckland in June 1962. By the end of the year it reached Suva, and by the end of 1963 the cable was completed to Vancouver through Hawaii, giving New Zealand a high-quality telephone service to North America, and through CANTAT (the transatlantic section of the Commonwealth cable), to England and Europe.

Morse telegraphy was obsolete by the 1960s. The last Morse telegram was written by Governor General Bernard Fergusson to the mayor of Eastborne in January 1963 and in October that year the last domestic Morse circuits closed down. By 1966 New Zealand toll operators were able to dial subscribers direct in Australia and Fiji. A system of dialling over long intercontinental cable circuits was being incorporated in a new international exchange installed in 1966–1967, when semi-automatic operation was introduced with Britain, Canada, and the United States.[52] By 1965 New Zealand was third in the world in telephone density, with 35 percent of the population now subscribing. Around 77 percent of all phones were on automatic exchanges. In the decade from 1952 to 1962 the number of subscribers increased by 99.7 percent, from 288,704 to 576,570. In 1964 almost 70,800 new installations were made and 19,000 were still on waiting lists.[53]

DINOSAUR COMPUTERS

During the 1960s New Zealand's largest businesses and government departments had begun to explore the potential of computer power. They'd been watching the deployment of these iron monsters overseas and begun to consider what impact they might have locally. In November 1960 after months of discussion Treasury finally leased New Zealand's first mainframe computer, an IBM 650, for its data processing centre, which officially opened for business in March 1961.

Its first major task was to handle the payroll for the country's 34,000 government employees. Initially it also helped establish a business case for several other departments, and within a couple of years nine departments had their own computers. The Department of Scientific and Industrial Research (DSIR) which had been set up in 1926, provided a computer advisory service for commercial firms through its physics and engineering laboratory. In 1961 Canterbury University and the Griffins biscuit factory also had computers and the following year Treasury considered its IBM 650 outmoded.[54]

A growing number of businesses and government departments began buying, leasing, or sharing mainframe computers for data processing. By the end of 1968 a total of 87 computers had been sold in New Zealand, mainly cumbersome mainframes that often took up whole floors of large organisations.

However international statistics in a 1968 report by the NZ Institute of Economic Research, showed that in comparison with other countries of roughly similar size where agriculture was a significant sector of the economy, New Zealand was slow to make the move to computers. The study compared the country's expenditure on computer rentals in relation to national income on a base of 100. The figure for Australia was 140, for Denmark 180, Norway 135, and Finland 120.[55]

Stephen Bell, a computer journalist writing in the New Zealand Computer Society's 25-year anniversary publication *Looking Back to Tomorrow*, said the computers of the 1960s were dedicated machines, most of them running a single application at a time, and scheduled externally by paper instructions. Their main purpose was to speed up manual processes, even after more sophisticated operating systems and the ability to handle multiple concurrent streams of work became possible.

> *"A census taken in the mid-1970s revealed at least 150 computers around the country; an industry in its own right employing more than a thousand people. The early machines were proverbial monsters with little internal storage and ... program instructions read and executed from ungainly storage 'drums.' Internal circuitry was built from transistors and other discrete components or even failure prone thermionic valves. The first major innovations driving the New Zealand private sector business market came around 1963 with the arrival of integrated circuitry, random access memory and the first of the real 'families' of computers, the IBM 360 series. This gave some promise of growth in computing power to match the growth of businesses themselves. The 360 brought the second wave of New Zealand business computing..."*[56]

The processing power and storage capacity of these lumbering giants would, however, be dwarfed by desktop computers within a decade and the communications capabilities of the telephone network enhanced to deliver valuable data links that spanned the world.

> *"At first the process was gradual. Faster refrigeration ships, the introduction of the telegraph and the telephone, the increasing use of air travel for the movement of people, documents and freight. The pace of change has accelerated rapidly. In the 19 years since Britain joined the EEC, New Zealand has actively sought out new markets for a wider range of products. It should come as no surprise that the more we reduced out dependence on Britain and the comfortable inks we had enjoyed for well over a century, the more dependent we have become on communications elsewhere... Communications technology has enabled New Zealand to regard its distance from markets and from the political decisions which impact on them as of decreasing importance. The speed of change has been rapid and will no doubt continue to accelerate. Whether it's the power of computing systems, the ubiquitous presence of fax machines, electronic handling of Customs and other trade documentation, or the ever-increasing capabilities of the telephone system, two things are happening at once. The capabilities are going up and the prices are coming down, bringing the latest technology within the reach of even the smallest businesses," Philip Burden, Minister of Commerce, 1992.*[57]

COLD WAR AND HOT POTATOES

As the 1960s dawned so did the political tensions between the superpowers. The world, it seemed, was on the verge of a nuclear confrontation. In 1962 the United States and the Union of Soviet Socialist Republics (USSR) were both building up nuclear arsenals for quick retaliation. Events in Cuba, where the Russians were locating nuclear ballistic missiles, led to a horrific stand-off, with both nations considering what life might be like in the aftermath of nuclear war.

US authorities were wrestling with the question of how to maintain communications or ensure the survival of any sort of 'command and control network' if such a nightmare were unleashed. Paul Baran believed he had a solution. A Polish immigrant, Baran had worked for the Hughes Aircraft Company and taken night classes at UCLA, where he earned a master's degree in engineering in 1959. That year he joined RAND, a US think tank. RAND (short for research and development) was focused mainly on solving national security issues and Cold War-related military challenges. The main concern was that the long-distance telephone network and military command and control networks were unlikely to survive a nuclear attack. While the lines themselves would probably remain undamaged, an enemy would certainly take out any centralised switching facilities. Facing stiff opposition from those who believed his ideas were unworkable, Baran began devising a more robust communications network using 'digital' technology and the concept of 'redundancy.'

Baran's system would decentralise the switching so the network could operate even if many of its links and switching nodes had been destroyed. There would be no central authority. All nodes would be created equal and able to originate, pass, and receive messages with their own unique addresses. If parts of the network were damaged each node would look for the next logical route to its destination. Information would be divided into 'message blocks' which would be sent separately across the network and pieced together in the correct order only when they reached that desired destination. Baran called his approach 'hot potato routing' or distributed communications.

Englishman Donald Watts Davies had independently come up with a similar approach, but called the message blocks 'packets.' The rapid store-and-forward design would require each node in a network to hold on to each packet received until it was able to determine the best route to its destination.[58] By 1964 RAND had begun to trial the decentralised approach to networking.

The first hint that an Internet like concept was being seriously considered within the academic community came through a series of memos from J. C. R. Licklider of Massachusetts Institute of Technology (MIT) in August 1962 about his 'Galactic Network.' Licklider, the first head of the computer research program at the Pentagon's Defense Advanced Research Projects Agency (DARPA)[59], envisioned "a globally interconnected set of computers through which everyone could quickly access data and programs from any site." He managed to convince his successors of the importance of his theories.

A year earlier, in July 1961, the first paper on 'packet switching theory' had been written at MIT by Leonard Kleinrock. His book on computer networking, published in 1964, convinced his peers of the theoretical feasibility of communications using packets rather than circuits. Ongoing research into computer communications in the 1960s resulted in the use of low-speed dial-up lines. While this proved that time-shared computers could run programs and retrieve data from a remote machine, it also confirmed that the circuit-switched telephone system wasn't up to the job. Packet switching was definitely the way forward.

In late 1966 another MIT researcher, Lawrence G. Roberts, further developed the computer network concept at DARPA[60], and the following year published his design for the ARPANET.[61] At the conference where he presented his paper he met with researchers from the National Physical Laboratory (NPL) in Middlesex, England, who had developed the NPL Data Network with Donald Davies. The NPL team were presenting a paper on packet networking and discussed with Roberts their own research and the work done by Paul Baran's team at the RAND group which had produced a paper on packet switching networks for secure voice communications in the military in 1964[62]. It became evident that the three groups had been working on the same objectives concurrently without knowing of each other's efforts.

In August 1968, after Roberts and the DARPA-funded community had refined the overall structure and specifications for the ARPANET, they went to market for the key components,

including the packet switches or Interface Message Processors (IMPs). Meanwhile, work continued on the architectural design, the network topology, the economics, and network measurement system.

Kleinrock's Network Measurement Center at UCLA became the first node on the ARPANET and in September 1969 the first host computer was connected to Stanford Research Institute (SRI), where Doug Engelbart was working on his Augmentation of Human Intellect project, an early hypertext system.[63] A month later the first host-to-host message was sent from Kleinrock's laboratory to SRI. Two more nodes were added at UC Santa Barbara and the University of Utah. These nodes included application visualisation projects, which were investigating methods for displaying 3D representations and mathematical functions using storage to deal with the problem of refresh over the network.[64]

Lineman testing overhead telephone wiring in Wellington, 1956.
Photo: Ferrymead P&T Society.

By the end of 1969 a fourth host computer was connected to ARPANET. Although the bulk of activity was around optimising the design and operation of the network itself, the building blocks for what was to become the Internet were now in place. As its stability was proven and other academic and research organisations became eager to share in this grand experiment, more host computers were added.

The network's intended use was for scientists and researchers to streamline collaborative efforts, but within two years they had transformed the fledgling network into an electronic post office for exchanging everything from technical data to messages about personal hobbies.

2

Battling with big iron

Unscrambling the code

These modern accounting methods are a far cry from those employed in the days of King Henry I, when the King's finances were controlled by a small group of administrators selected from the baronage and the clergy. This body constituted the Exchequer, so called from the chequered tablecloth used to facilitate the counting of money.
New Zealand's controller and auditor general, commenting on computer introduction in 1960.[1]

New Zealand was rapidly evolving from its rural roots and increasingly leveraging its industrial and commercial strengths, all of which required efficient communications. Many government departments, universities, and businesses were now on to their second and third generation of computing power and looking seriously at connecting them into networks.

The methods available were, however, highly proprietary, allowing only an IBM or Burroughs mainframe, for example, to connect to their own terminals and perhaps an identical machine across town over the telephone lines. If you had another brand of computer you were out of luck, unless you had some very resourceful technical types on staff. The government had several large computers processing the payroll of public servants, and for doing the public accounts and those of various trading departments.

By the early 1960s firms could communicate between head office and branches or with other businesses by leased telegraph circuits. Telegraph switching had been introduced in 1964 with automatic switching possible at the three main centres, with a special code for each station. By 1966 there were 441 telex subscribers and a public telex booth system launched in 1971. A faster automatic service of switching telegraphs on larger circuits was also possible.[2] In April 1970 the NZPO began offering its Datel (data/telephony) service, sending computer and telex data over dedicated lines at 2400bit/sec (bits per second).

The number of inland telegrams had declined markedly since the war, displaced by other forms of telephony. By 1950 there were 5.7 million telegrams sent, by 1970 it had dropped away to 1.95 million. Intensive development of telecommunications in the 1950s and early 1960s had created a network valued at £100 million, with the third-highest telephone density in the world behind the

United States and Sweden but ahead of Canada.[3] Between 1950 and 1970 the number of telephone subscribers had grown from 250,000 to 800,000 and staff numbers at the NZPO had doubled to more than 32,000.[4] By 1971 the number of telephone users had passed the million mark.

The nation's phone network came under increasing pressure – the so-called 'broadband' network was now carrying thousands of circuits. The first satellite station opened at Warkworth, north of Auckland, in 1971, hugely speeding up the delivery of television programmes and news from around the world. That gave TVNZ less reason to repeat content, and gave the Post Office an important alternative for reducing congestion with international phone calls. It also opened up new possibilities for computers to gain access to international databases.

The Databank computer centre (circa 1969) which began data processing work for the major banks opened its doors in 1966 encoding and reading cheques and by 1969 it was a huge networked computer bureau embracing six centres around the country. This IBM System 360 equipment used punch card data entry which could operate at 800 characters per second.
Photo: Databank Brochure.

In 1972 there were 200 business computers in the country, mainly unwieldy mainframes that needed huge, air-conditioned rooms to operate. They were fed punch cards and spat out their data on huge plan printers in plain Ascii-type characters. By 1969 nine government divisions had computers, with Treasury, the Department of Education and DSIR acting as bureaus for other departments including Social Security, the Post Office, and Railways. In 1970 two bureau operations were centralised, along with Statistics Department data processing staff, into the Government Computer Centre (GCS) as an independent unit within the Department of Internal Affairs. By 1972, it became the Computer Services Division (CSD), of the State Services Commission (SSC).[5]

By the mid-1970s the CSD had become a highly centralised operation, running four large computer centres and four data-preparation centres. The Vogel Computer Centre was operated by the Ministry of Works and Development as a science and engineering service for all government departments, under contract to the SSC, and used by a range of agencies including the Electricity Department, Forestry, and Broadcasting. The Wanganui Computer Centre was operated on behalf of the Police, Justice, and Transport ministries. The Trentham Computer Centre in Hutt Valley had been intended for the DSIR but didn't become operational until 1978, and when it proved unsuitable for the task was relegated to handling the needs of Customs. In Wellington the Cumberland Centre housed the accounting functions for State Insurance, Government Life, the public service, and teachers in the education system. The Pipitea Computer Centre handled data for the Social Welfare, Inland Revenue, Valuation, and Housing departments.

All the CSD centres had data communications networks extending from Kaitaia in the north to Invercargill in the south. The Ministry of Defence, Post Office, Department of Health, and New Zealand Railways Corporation also retained their own equipment and computing organisations, including data communications networks. Most local authorities had their data processing needs met by computer bureaus.[6]

BEGGARING WITH THE BURROUGHS

Across the universities the main communication between the key information science people was face to face, typically when two or three from each campus would meet with a government committee to discuss issues. The Department of Education had made computing a priority for all university campuses. The first breakthrough came in 1971 when the government, through the Vice Chancellor's Grants Committee, arranged to buy five brand-new Burroughs 6700 (later Unisys) mainframes with a view to networking them.

The B6700 machines were an upgrade to the Burroughs 6500; large systems with integrated circuits that could handle up to four processors for symmetrical multiprocessing (although their new owners could only ever afford to use the single processor version). The machines were valued at about a million dollars each and the terminals that connected to them were $9000. They featured a stack architecture[7] with instruction sets designed for easier running of software than the traditional hardware-based approach. They had specific support for high-level languages such as Fortran and Cobol as opposed to assembly language. All systems software was written in an extended version of ALGOrithmic Language (ALGOL). The Burroughs could compile as quickly as they could read the source code from punched cards, and were reputed to have the fastest card readers in the industry.[8]

Auckland University just scraped in to take delivery of the first of the B6700 machines in March 1971. "We couldn't have a computer because we didn't have a building to put one in, we couldn't have a building because we didn't have a computer centre director, and we couldn't have a director until we'd decided which computer we were likely to buy," recalled former IT director and computer science associate professor, Nevil Brownlee. Neil Mowbray, who was professor of civil engineering at the time, somehow succeeded in getting all three just in time to qualify for the Vice Chancellor's Grants Committee funds for the Burroughs acquisition. "For a brief spell of about three months we had the most powerful computer in New Zealand," Brownlee said.

However, as the deal was being signed off, it became apparent that Lincoln College and Waikato University were not included. Waikato was expected to make do with its existing IBM 1130 and a link to Auckland University's machine. Neither Auckland nor Waikato had a faculty directly related to computing, so it was felt their needs could be met by one system. It was clear Waikato, which had relied on a small group of academics to administer computing on campus, needed to formalise the position of computer department director if it was to attract any future computing investment.

Meanwhile, it stubbornly refused to sign off on the deal, which saw it sidelined as a poor cousin to Auckland. By early 1974 the contract for the Burroughs B6700 in Auckland and the terminals at Waikato were still unsigned. The plan had shown four terminals connected to a DC1200 terminal unit linked to Auckland via a modem connection. However the terminals never worked as specified and would only operate a card punch, card reader, and line-printer and needed to be re-configured. Auckland University was still quite disorganised in the computing field and had no formally organised Computer Science Department, which meant Waikato got very little service. Burroughs' reputation was on the line as long as Waikato refused to sign off. Eventually it conceded under ministerial pressure.[9]

"The DC1200 was a bottleneck from day one. Enrolments crept towards 800 students. Two key punch operators working full time were snowed under. COBOL programs took three to four days to get punched and verified before being sent up the line to Auckland to be compiled and run. Then there was the two-day delay before the results were received. The error rate was high, even though the programs were punched twice to check the input, they would invariably come back with compiler errors; weeks might pass before a single program would successfully compile and run," claims the university's computing history site.[10]

John Houlker had been studying physics and mathematics at Waikato University when an interest in computers intruded. Sidelining his original aspirations, he hung out in the CSD and began working there part-time. His first experience was with the Burroughs machines. "They were kind of elegant, really. I still have a soft spot for those machines. They were a fairly advanced architecture for their time. The promise was that having a remote link through a leased line to Auckland University's Burroughs machine would be just as good as having our own machine. I think we got short changed. Let's just say as a student operator, I noticed features meant to ensure we had equal share were missing in the control system at the Waikato end, so I reprogrammed the interface. Initially we didn't notify Auckland what we had done but after a while I think they were surprised to learn what had been going on. Certainly for the Waikato Computer Department it was an improvement."

Lincoln College had also missed out on the computing spend-up and was forced to share with Canterbury University in Christchurch. Canterbury had built an internal network based on the Burroughs equipment but it could only communicate with its own terminals. When Robin Harrington[11] joined the CSD in 1972 he was told the researchers wanted equipment they couldn't buy off the shelf connected to the computer. "My brief was to source the pieces and connect them together." One major challenge was linking the Burroughs mainframe to Lincoln College but as Waikato University had found out, the equipment provided by Burroughs to achieve this was less than satisfactory.

One of the development tasks was to replace an IBM 1620 operating a plotter, with a Digital Equipment Co (DEC) PDP-11[12] version and get that to work with the Burroughs. "We displaced the Burroughs DC1200 unit and developed our own protocols. Then the engineers had the idea of using the same technology as a remote job entry system, to provide a link to the engineering school 1km away. It was more reliable than the equipment Burroughs supplied. So Waikato used our technology to replace their Burroughs box; we put a larger one into Lincoln and sold one to the Reserve Bank in Wellington as well."

The Digital protocols, needed a more advanced operating system so Canterbury built its own. CSIROnet in Australia were doing a similar thing and the Department of Scientific and Industrial Research (DSIR) mimicked that.

PUSHING THE BOUNDARIES

In 1973 discussions began on how to connect the Burroughs B6700 mainframe at Victoria University to Aloha University in Hawaii using the Post Office's X.25 packet network. The pioneering Alohanet, developed at the University of Hawaii and deployed from 1970, used ham radiolike shared transmission systems to create a computer network across dispersed campuses.

Initially it used two frequencies, with a hub machine broadcasting packets on an outbound channel and client machines sending data to the hub on the inbound channel. All nodes would communicate on the same frequency with communications sent via a teletype so the data rate usually didn't exceed 80 characters per second. However two stations couldn't talk at the same time or the messages would be garbled. Any machine noticing corrupt data would wait a short time and then re-send the packet. This required a system to control who could talk at any time, resulting in the development of contention management systems that later assisted Bob Metcalf and others at Xerox PARC in Palo Alto, California, in producing the Ethernet protocol.

Alohanet had connected to the experimental ARPANET from 1972.[13] "We had the opportunity to connect to Alohanet but the nearest dish was Wellington Polytechnic. We wanted to put one up at the university, it was a research project that required only a small amount of money but no one

thought it was worth doing so it didn't get done," recalled Mike Newbery, who was working at the computing services centre at Victoria University.

At this stage the only activity that might have been considered networking consisted of a few Burroughs TD800 terminals linked back to the mainframe data communications processors, even though some of them were on fairly long lines. The first real attempt at linking university computers took place in 1975 when Victoria University and Massey University began experimenting with their Burroughs machines, using a pair of synchronous modems operating at 4800bit/sec. The plan to share resources on-line was optimistically dubbed KiwiNet but the link was down more than it was up.

Meanwhile Victoria University's Burroughs 6700 was connected to a Hewlett-Packard HP2100 mini computer at the Applied Mathematics Division of the DSIR, which was on the university campus, and out to a B6700 at the Reserve Bank. This still didn't qualify in any real sense as networking. While staff at the DSIR made use of Victoria's B6700, they were not able to connect to Massey. Neil James was in the computer centre at Massey University at the time. "We proved the connectivity and that's about as far as it went. In concept we were looking at possibilities of load sharing, to even out demand on the Burroughs machines at both universities, which in hindsight I don't think we had much show of achieving," said James.

The first example of anything that even approached successful networking, was when he took one of the Burroughs terminals and an acoustic modem,[14] which the department had acquired from the United Kingdom, to his home. "You would clamp the phone hand piece into the box and dial up so the tones of the phone connected to the computer at the other end. It worked at 30 baud (bits per second) but there was never any practical use."

This was early experimentation, largely to gain experience in networking. By the end of the 1970s when he left to head the Computer Science Department at Otago University, there was still precious little in the way of networking happening at Massey, said James.

DSIR BREAKS RANKS

The DSIR, which had locations around the country including Massey University and Victoria University campuses, had an important role to play in the ultimate development of the university networks. The Applied Maths Division (AMD) of the DSIR had an Elliot 503 computer, which had been perhaps the second computer in the country,[15] and the scientists wanted to understand their options for the future.

Frank March was at Canterbury University when he noticed the DSIR was advertising for someone with a research background. "It didn't particularly matter what field of science but they wanted someone who could advise scientists on the use of computing." March had a PhD in chemistry from Canterbury University and had done postdoctoral studies in Canada and the United Kingdom. While overseas in 1974 he'd had access to remote computing resources at Sussex University as part of his work as a chemical crystallographer, one of the disciplines that was a great consumer of computer power. That network would a decade later become the Joint Academic Network (Janet).

The DSIR had been assigned the ICL mainframe which was going in at Trentham; however there were delays getting it installed, so from 1975, as a stop-gap measure it was given access to the Cumberland centre. Cumberland was using an older IBM batch command language networking system to connect devices and terminals, while the Vogel Computing Centre had migrated up to systems network architecture (SNA) networking, creating major incompatibilities.

March, who joined the Cumberland Computing Centre looking after DSIR interests, wasn't happy that they'd had been sidelined to use computers not designed for scientific use, but the plan was that the DSIR would go to tender in 1975 for a sophisticated network of its own. IBM was

the only vendor to respond and pitched its $6 million system around the new SNA. However the Muldoon government intervened, decreeing that all government work would be done on three centralised bureau computers in Wellington.

The foundations for the DSIR network were established from about April 1976 when the organisation's Physics and Engineering Laboratory (PEL) created the Computer Research Section (CRS) at Gracefield campus in Lower Hutt. PEL also built its first wide area network (WAN) based around the DEC PDP-11 mini computers and communications controllers. The basic software and protocols were developed by John Paine at Australia's Commonwealth Scientific and Research Organisation (CSIRO). Paine had developed a system called NodeCode, which ran on any of the PDP machines, and offered it for free, as long as there was a reciprocal arrangement when the DSIR had interfaces with the IBM computers.

Some of the DSIR's AMD staff moved out to PEL at Lower Hutt to set up the CRS and develop the interface between NodeCode and whatever computer the DSIR was going to use. When March joined them in September 1976 they had nearly completed the connection with the Cumberland Computer Centre. He recognised later that Paine, working entirely on his own, had come up with a networking code remarkably like transmission control protocol (TCP), which was under construction at Berkeley University. "He'd obviously been reading the Berkeley papers, knew what was going on and incorporated it to the best of his abilities."

The DSIR network itself had no computing power. It functioned as a message-switching network, connecting teletype machines or 'dumb' terminals to a selection of host computers. "I recall the day we exchanged the first complete message. There was a collective celebration and everyone went to the pub. It was a wonderful occasion," said March.

When the ICL 2980 at Trentham finally became operational in 1978 it was quickly discovered to be a clunker, and a decision was made to use it mainly for Customs. The DSIR stayed with the Cumberland centre where it now linked to the IBM system 370/168 because it was able to emulate the IBM binary synchronous code (BSC) protocol, the predecessor to SNA. CRS staff wrote gateway software to link the mainframe hosts and the DSIR's communications nodes.

DSIR Gracefield staff also had access to the Ministry of Works and Development IBM system 370 via a single IBM 3270 terminal from late 1980. The Ministry of Works was one of the few organisations with an IBM SNA network. It was used for design and engineering, including building bridges and roads, and had connections to line printers and card readers across the country. The big mainframes could handle interactive time-share computing, using stand-alone IBM 3270 terminals. They transmitted in batches of up to 1024 characters at a time in each direction – about 2000 characters would fill the screen, March said. The trouble was the Vogel and Cumberland centres couldn't talk to each other.

March ended up writing SNA gateway emulation between the DSIR and Cumberland's IBM well before other third-party systems were commercially available. "One of the key programmers had left about three or four weeks after I arrived and they said, 'Well look, you'd better do this job.' I suddenly found myself programming PDP-11 assembler on a protocol I had never even heard of before. It was a wonderful experience. It really got me hooked. I lived and breathed it and was totally absorbed for about 12 months." Now the DSIR team could emulate their way into the Cumberland network, which mainly looked after government payroll and administration. They could make use of the scarce resources allocated to them for scientific use and began writing sophisticated programs using a Fortran Compiler.

March recalls Victoria University computer staff, who had been working on the KiwiNet link between Auckland and Wellington, coming to Gracefield PEL to advise on the use of X.25 for communications. "We asked them how they were getting on and they admitted they were still

playing around with it and couldn't really get it working. I think they were a little shocked when we told them we had a working network that was about to go into production."

The DSIR network went live in April 1977 with a BSC gateway converting the protocols from a teletype machine which was keying characters to the IBM in one direction and reversing the process at the other end. "It simulated an IBM network to an IBM computer. From there we collectively developed it to become more sophisticated, and by 1978 we had an SNA network connecting with Cumberland long before such products were commercially available,"[16] said March.

Eventually the DSIR managed to convince the authorities that the centralised IBM computers in Wellington were not well suited for scientific computing. "They were not fast or responsive enough; we needed interactive computing. We had many meetings to try and convince them. It was a hell of a fight but we managed to get new machines funded." So over a three-year period the DSIR in Wellington acquired three DEC VAX 11/780 machines and two VAX 11/750s. These mid-range machines were capable of 'interactive computing' with up to 40 people simultaneously. "The little DEC terminals were quite sophisticated machines for their day; probably the best of what was available," said March. The move to the DEC environment meant the relationship between the DSIR's Applied Mathematics Division and the Computer Sciences Department and Computing Centre at Victoria University became even more productive.[17]

KIWINET RESURRECTED

By October 1976 some of the technology and many of the lessons learned from KiwiNet provided a foundation for what was to become VicNet, a general purpose network that linked the machines on the Victoria campus to Massey University's B6700. It was achieved using the Post Offices X.25 packet switching network. The project received extensive coverage at the Sixth New Zealand Computer Conference, and while it achieved modest success on the Victoria campus, Massey University missed out on funding for the leased line and never successfully linked.[18]

Meanwhile the Computer Science Department at Waikato, now formalised with its own director but still smarting after being forced to share sparse resources with Auckland, didn't like its chances of getting funding for a separate machine after the prolonged protest of 'the Burroughs incident.' It conspired with a group of lawyers to get approval for its preferred machine, a brand-new DEC PD-1170 at a cost of $548,000. The deal was done at 11 a.m. and at 11.01 a.m. the machine

NETWORKING THE NETWORKS

The way computers traditionally communicated was through a point-to-point link over dedicated lines using circuit switching, which passed individual bits across the telephone line on a synchronous basis. The only other option was for one network to become a component of the other, rather than being a peer in an equal service relationship.

Work on developing and refining a host-to-host approach to underpin the network and standardise software development gave rise to initial development on the network control protocol (NCP) in December 1970. This work by the Network Working Group (NWG) at DARPA enabled application development to begin in earnest.

Within two years researchers were pursuing the idea of open architecture networking, which would enable networks of different designs to share data between users and providers, regardless of geographic location or

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interface requirements. This concept was first introduced by Bob Kahn at DARPA in 1972 as an outworking of the packet radio program he'd been working on, which required reliable communication regardless of jamming, radio interference, or intermittent blackouts.

In October that year Kahn organised the first major public demonstration of the ARPANET at the International Computer Communication Conference (ICCC). Basic 'send and read' software had been written in March by Ray Tomlinson, one of the ARPANET equipment contractors, to enable developers to more easily co-ordinate their efforts. In July it was expanded by Lawrence Roberts, who wrote the first mail utility program to list, selectively read, file, forward, and respond to messages. The result was email, the first 'killer application," which dominates Internet use to this day.

However NCP had severe limitations. It couldn't address networks and machines further downstream than the interface controllers (IMPs) of ARPANET. Broadening its use would only result in the network becoming unreliable, with packets lost and applications crashing. What was needed was a communications protocol with better error controls. Khan began work on 'Internetting,' including a new version of a protocol that would more easily embrace external networks.[20]

Vint Cerf, who had been intimately involved in the design and development of NCP at DARPA in Arlington, Virginia, along with Bob Khan, began working on a detailed design for a new protocol from 1973. What they achieved would become known as the TCP. The first papers outlining their collaboration were distributed at a special meeting of the International Network Working Group (INWG) at Sussex University in September 1973, chaired by Cerf. The paper described the TCP protocol, which would provide all the transport and forwarding services in the Internet.

The first implementation only allowed virtual circuits, which worked fine for file transfer and remote log-in applications. But there were problems with more advanced applications such as packet voice, the precursor to Internet telephony. Consequently the protocol was reorganised in two segments: the simple interpret protocol (IP), which focused on addressing and forwarding individual packets, and TCP, which was more concerned with service features such as flow control and recovery of lost packets.

The original 'Internet' model was geared for nationwide networks like ARPANET, but only a relatively small number of hosts were expected to connect. Ethernet, which would redefine future network connectivity, was also under development at Xerox PARC laboratories in the early 1970s at a time when no one anticipated the imminent growth of local area networks (LANs), let alone the widespread use of PCs and workstations.

Consequently a 32-bit IP address was used. The first eight bits signified the network and the remaining 24 the host on that network. This assumed that a maximum of 256 networks would meet the needs of the Internet for the foreseeable future. Within a couple of years, however, the protocol and the expectations of connected hosts would have to be dramatically revisited to push past these in-built technical limitations.

DARPA let three groups, Stanford University, research group BBN (Bolt Beranek and Newman),

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and UCL, implement TCP/IP. The Stanford team, led by Cerf, produced detailed specifications and within a year there were three independent implementations that could interoperate. The long process of collaboration and experimentation continued as the concept and technology of the Internet matured.

Early implementations of TCP/IP were for large time-sharing systems. When desktop computers first appeared, some thought the protocol too unwieldy. David Clark and his research group at MIT, however, moved things forward with a compact and simple implementation for the Xerox Alto, an early personal workstation developed at Xerox PARC, and shortly after for the IBM PC. In 1976 Leonard Kleinrock at MIT, who had earlier helped develop packet switching theory, published the first book on the ARPANET, which was influential in spreading the lore of packet switching networks to a much wider community.

The innovations that began with ARPANET accelerated computer connectivity from isolated low bit-rate experiments into a streamlined architecture that would eventually revolutionise global communications. The usefulness of email began to catch on and many computer networks sprang up in the 1970s solely for that purpose, particularly across US Government departments and research institutions. Although it started as a research project, ARPANET had quickly developed into a communication tool for email, discussion groups, and file exchange.[21]

The Unix operating system, developed with an email facility for public computer forums, was made freely available to anyone who wanted it. It was this act of philanthropy that rapidly spread email beyond the initial community of interest, in particular to university and research campuses around the world. Those communications tools also became the basis for the Usenet newsgroups.

The anarchic nature of the growing network of computer networks was perfect for sharing scientific papers and computer code but the group of mainly young code cutters, scientists, and academics working on the project had other interests. Soon they were devising games that could be played over networks, and using mailing lists to connect with like-minded others about the books they were reading and movies they were watching. The most popular but unauthorised mailing list on ARPANET became SF-LOVERS, for science fiction fans, mainly talking about the latest *Star Trek* episodes.

was sold for exactly the same amount to a merchant bank. At 11.02 a.m. it was signed back to the university on a rent-to-buy contract. The Ministry of Education, believing it had been cheated, was furious. The university had purchased the machine, avoided sales tax, sold it to pay the vendor, and established a low rental rate for full access to a state-of-the art machine, all within a matter of minutes.

"The PDP 1170 was a marvel. It had a superior time-sharing mechanism, making it ideal for a large user-based environment like the university. Of course there were those that felt the machine was lacking in many areas, compared to other time-sharing systems, but these were usually number-crunchers," states the Waikato University computer history web site. The upshot

was that computer science at Waikato University was now a popular subject, offering 14 computer science papers.[19]

John Hine, originally from upstate New York, had met his New Zealand wife Paula while she was on her 'big OE[22].' He'd been studying computer science, specialising in operating systems and some early networking, at the University of Newcastle on Tyne in England. After gaining his PhD in computer science he was lecturing at the University of Connecticut when in 1977 he and his new wife decided to head to New Zealand to visit her family. He took a job at Victoria University, lecturing in what was then known as the Information Science Department. He was the only person there with a PhD in computer science. New Zealand universities were at various stages of developing computer-related disciplines and WAN was still something of a dream.

In Newcastle Hine had been working on an IBM 360/67,[23] which was designed for time-sharing, so arriving at Victoria was like taking a step back in time. The universities were still struggling with the Burroughs B6700 machines. Very little networking had resulted but it had benefited computer science departments, giving them an entry into the revolution now gaining momentum around the world. "From a networking perspective there was some initial toying around, because that's the only way to describe it, between Massey and Victoria University campuses, the Computer Services Centre at Victoria which had a DEC PDP-5[24] machine, and the Applied Mathematics Division of the DSIR."

He had to suffer a year with the old Burroughs B6700 punch card-operated mainframe before the arrival of 'interactive computing' on a new Digital Vax. "The only real connectivity was a group of us within the Computer Services Centre at Victoria emailing around the building using the Unix-to Unix copy protocol (UUCP) connectivity tools that came with the Unix operating system, and some connectivity with the DSIR AMD and the campus library."

Meanwhile the telephone network was undergoing major upgrades with users given increasing autonomy in the shift from the old party-line, operator-based system, to subscriber trunk or toll dialling (STD), which was available in most centres by 1976.

STD was common in the United States, Britain, and Australia by the early 1970s, but its arrival in New Zealand was delayed because the Post Office had to meet the demands of extending free calling areas and obtaining the full coverage needed for automatic telephony, which was a precondition of a nationwide STD system. A ban on tariff increases in 1972–1975 had also cut revenues available for the conversion. By early 1977 more than a third of the network – 357,000 subscribers – had access to STD. The roll-out to the rest of the country was painfully slow and lasted until the end of the decade.[25] A substantial upgrade of the national telecommunications network had taken place on 5 March 1976. Enhanced crossbar equipment was cut over at four central exchanges in Auckland, Hamilton, Wellington, and Christchurch.

From December 1979 a link through the Intelsat IV satellite, in conjunction with new NEC 820 crossbar equipment in Auckland, enabled international subscriber trunk (ISD) dialling from New Zealand. Intelsat circuits leased to the International Maritime Satellite Organisation (Inmarsat), which New Zealand had joined in July 1979, meant instant access for local users to Tymnet and Telenet, two North American data networks that were part of Oasis (Overseas Access Service for Information Services). The service proved popular with New Zealand libraries, as they could access the Dialog database with its then 18 million bibliographic entries.[26]

A DECADE OF CHANGE

During the early 1970s New Zealand began to catch up with the world. You could hear it in the music and see it in the pace of technology and the move away from post-war mindsets. There was rebellion in the air, a strong interest in what was happening in the rest of the world, and a deep

desire to connect into those growing databases being compiled by scientists offshore. It was a time of political and social challenge. The country had gone from having one television channel to two colour channels and radio transmission was slipping away from government control. Home video recorders had been introduced.

By 1974 more than a million New Zealanders now had telephones and the New Zealand Broadcasting Corporation (NZBC) was restructured, with Radio New Zealand and two TV channels operating under the Broadcasting Corporation of New Zealand. It was announced the Wanganui Computer Centre would store information on individuals from the Justice, Police, and Transport departments.[27]

In 1976 the Tasman 1 cable between Auckland and Sydney came into service in a joint venture between the NZPO and Australia's Overseas Telecommunications Commission (OTC). Cable manufactured by Standard Telephones and Cables stretched 1258 nautical miles, with 155 repeaters replacing the COMPAC cable between Australia, New Zealand, and Canada, which had been laid in the 1960s.[28]

In 1977 the New Zealand national anthem was changed from "God Save the Queen" to "God Defend New Zealand", the 200-mile economic limit was imposed and the Beehive was officially opened. On 5 January the longest and most controversial Maori land occupation began after the government announced plans to sell Bastion Point.[29] After 506 days Muldoon ordered the eviction of the protestors, and the burning of their makeshift homes. There were 222 arrests there. That year New Zealand's first feature-length film since 1962 was made: *Sleeping Dogs*, the movie adaptation by Roger Donaldson of C.K. Stead's novel *Smith's Dream*. The political thriller about right-wing dictatorship ruling New Zealand and imposing martial law after industrial disputes got out of hand was another measure of the mood of the nation.

In 1978 the first arcade and console games began appearing here, including *Pac-Man*, *Space Invaders*, *Star Trek*, *Pong*, and the original role-playing game, *Dungeons and Dragons*. About 95 percent of New Zealand homes had television by then.

The economy was suffering through rampant inflation in the aftermath of the 1973 energy crises and the loss of New Zealand's biggest export market after Britain entered the European Economic Community (EEC). The Muldoon government maintained a high level of state intervention, borrowing heavily to support its 'Think Big' strategies, which included large-scale industrial projects designed to create more jobs. The government also had to borrow to support the welfare state and cover agricultural subsidies. Under pressure to pay back national debt and control wages, which were spiralling out of control, Muldoon did a deal with the Trade Union movement to reduce taxes if they stopped pressuring for wage increases. In 1982, when his tactic appeared to have little effect, Muldoon imposed a total freeze on wages, prices, interest rates, and dividend payouts, which lasted for two years.

Meanwhile the technology that would transform the nation continued to evolve. The United Nations declared 1983 World Communications Year, with the idea that computers and communications technology were about to come together. The aim was "to stimulate accelerated worldwide development of communications infrastructures and to provide an opportunity for all countries to undertake an in-depth review and analysis of their policies on communications development."

By 1980 the Post Office was supporting about 800 leased lines and 1800 modems.[30] In 1983 it took the plunge and invested in a 14km fibre cable system between Wellington and Lower Hutt. The 10Mbit/sec pilot, capable of carrying several hundred telephone circuits, was the first use of fibre-optic technology in the country. While clearly exploring new options to ease congestion, the Post Office mail and phone monopoly was still way behind the capacity curve.

There was strong interest in the new Post Office satellite-based X.25 packet switching[31] data service (Pacnet) which had been in trial mode since early 1983. It was the only nationwide public network with a uniform cost structure. Cabinet had approved its introduction in September 1979, and $2 million in equipment was ordered from the French firm SESA. Pacnet was designed specifically for business customers with a number of dispersed terminals or teleprinters linked to a central computer, operating at different transmission speeds, anywhere from 2400bits to 48kbit/sec. Its use was mainly for data, although digital speech was not excluded. The packetised data service became commercially available from August 1984 and considerably expanded the Post Office digital data network (DDN).[32]

AWA (NZ) won the contract to upgrade the DDN, including the installation of a videotext information service. Videotext was similar to the UK-based Prestel system, which allowed text to be displayed on screens with the aid of primitive modems on the telephone line. It began to be commercially available from February 1984 and expanded to include data from Valuation New Zealand, Databank, and serviced special-information networks, including Farmnet and Teledata. Its biggest challenge was the arrival of TVNZ's Teletext service, which delivered on-screen TV programme data plus basic services and news items useful to the investment and farming community.[33]

Another major use for the phone lines made its debut in 1984 as electronic funds transfer at point-of-sale (Eftpos) appeared on the retail scene, only five years after the country's first bank ATM was installed. The first system operated from a service station and a supermarket attached to a bank computer.[34] Expanded use of the Post Office network had grown to include the use of facsimile machines for offices and homes. The number of private fax machines grew from 200 in 1984 to 800 by 1986, and soon took off as a major communications tool. In 1986 the Post Office began commercial operation of its Starnet electronic mail service, enabling messages to be left for business subscribers, government departments, and universities in 'electronic mailboxes' on computers.[35] Users would log in to the remote database to download or send messages, which were delivered via the Pacnet network.

Amidstst pockets of innovation, politics kept the Post Office lumbering along to its own tune, and it was often hijacked for partisan purposes. Decisions about which exchanges would be upgraded from manual to automatic often tended to be influenced by other factors than business necessity. Post Office staff were frequently forced to comply with the whim of particular politicians and resented the diversion when there were clearly more pressing problems to be attended to. According to Vivienne Smith in her book on the history of the Post Office, *Reining in the Dinosaur*, one classic case was the automation of the Te Kuiti telephone exchange shortly before the 1984 general election.

> *Incongruously this small rural town, in the electorate of a highly ranked Cabinet minister, was given the most modern technology, including call diversion capability... A staffer recalls: 'Now that year, when the New Zealand Post budget went before the House, it was arbitrarily halved because we had to cut government spending. And what was left over was to be redirected to the automation of country manual exchanges. The commitment was given to the electorate that this exchange would be up and running by a certain date, so the Post Office was expected to respond. That meant recabling the complete town of Te Kuiti, and that took resources. They had construction gangs out of Auckland, construction gangs out of Hamilton and, of course, they were all being paid exorbitant allowances for being away from home. But the deadline was met and the exchange was up and running and it had call diversion, which was a brand new thing in New Zealand at the time. What was also happening at that time was that businessmen in Queen Street, at around 10.30 just about every weekday morning, would try and ring their colleagues down Queen Street and they couldn't because the exchange was*

falling over. Why couldn't we do anything about it? Because everyone was down at Te Kuiti making sure this cut-over occurred smoothly and on time.[36]

Digital switching and transmission took a giant leap forward on 16 November 1984 when the first Wellington-Auckland link using digital microwave and co-axial cable technology went live after two years of planning. The $24 million system had delivered a 640km digital link that could transmit voice and data at 140Mbit/sec per circuit. At the same time new computerised stored program controlled (SPC) exchanges were cut into the network. A thousand new circuits were added to the digital link within two years, as the system was expanded to the main South Island centres. A major SPC upgrade was installed in the Auckland area from 1984 after a massive 20 percent upsurge in toll traffic in and out of the city – caused by an election year boom and rising business confidence. Regardless, subscribers continued to face delays and overloading.[37]

DRAGGING THE CHAIN

By 1984 the State occupied a huge place and a stifling role in the New Zealand economy. Government spending accounted for over 40 percent of New Zealand's GDP, and it employed 31 percent of the nation's workforce.[38] New Zealand's economy was one of the worst performers in the OECD. GDP per capita had declined from fifth in the world in the 1950s to 20th in the 1980s.[39] The newly elected Labour Government, due to take office after the July 1984 elections, was in for a shock. The projected $5 billion deficit was the biggest in the country's history and far larger than the Muldoon government had acknowledged. The country also faced a constitutional crisis played out in the media, as Muldoon refused to agree to the measures the incoming government wanted to put in place to manage the crisis, including an immediate 20 percent devaluation of the New Zealand dollar. "We changed New Zealand in our first 13 days and we weren't even Ministers of the Crown. Before we were even sworn in we had taken away the huge range of restrictions and strange prohibitions and all those Polish shipyard rules that we laboured under and we had become inexorably committed to a totally new economy," recalled Prime Minister David Lange, in Vivienne Smith's book, of those tumultuous first days of the Labour Government.

Roger Douglas, the minister of finance, spent the first three months in office concentrating on the big items, getting rid of subsidies and tax breaks, and looking at the reform of State-Owned Enterprises (SOEs) to make them more efficient and accountable. This also meant a review of their role in the production of goods and services, and their contribution to the country's economic well-being. "We started seeing the government organisation as being an institution with a huge impact on the efficiency and transformation of resources into useful products and stopped assuming, as the classic bureaucratic model does, that a bureaucracy is a black box that does what its told – the politicians give it instructions, and it immediately carries them out. We started thinking…it's nothing like that at all. The bureaucracy itself is a huge potential distortion in the transformation of political will into the delivery of public services and government interventions," said Douglas.

Vivienne Smith, in *Reining in the Dinosaur*, said Treasury was concerned at the inability of the SOEs to draw the line between social and commercial demands. They didn't have to pay the going rate for government finance. Many of them didn't pay tax and what they did with their funding did not reflect its true cost encouraging them to use more of it. That had led to excessive expansion of activity or artificially low prices for goods and services. Many SOEs were engaged in conflicting roles, acting as policy adviser and regulator in the areas of business where they derived their greatest revenue. Such protections and regulations had worked against effective competition and needed to be eliminated.[40]

  

TOP LEFT: Michael Morris, author of the report that recommended the split up of the NZPO.
MIDDLE: Roger Douglas.
TOP RIGHT: Laurence Zwimpfer.

The Post Office was the country's biggest employer, with about 40,000 staff. It had 1262 post offices and agencies across the country, total assets of $4.5 billion, and only ten accountants. According to chairman Michael Morris, who co-authored the 1986 'Mason-Morris Report,' it was an old-fashioned organisation that had developed from the 19th century postal operation into a head office and district structure through the ad hoc addition of functions dictated by communications technology and economic factors. The working environment was "characterised by inertia and frustration."[41]

The union's motto was: 'Post Office work for Post Office people' and that resulted in many jobs that could have been contracted out, being done in house. "You name it they did it: electrical work, plumbing work they had painters, carpenters, motor mechanics, all sorts of minor repair work to telephones was being done in their workshops," Morris said. Personnel policies bore a strong resemblance to the game of snakes and ladders. Inflexible practices meant anyone rejoining the Post Office after a period of employment elsewhere could not come back on the grade they left at. Instead they had to go to the bottom of the grading scale and start again, despite critical shortages of people with particular skills.[42]

By 1985 New Zealand was divided into 22 districts for postal services, each under control of a chief postmaster and 17 telecommunications districts, each under the control of a district or regional engineer. This in itself caused major administration and co-ordination problems. On the telecommunications side there had been rapid growth in the demand for high-quality telephone services as well as an explosion in the use of computers for communication purposes in the public and private sectors. The organisation was dominated by the telecommunications engineers, who were interested only in the technical aspects of the operation, not the business side. But they had their own problems trying to get access to the latest equipment.

Former post office senior engineer Laurence Zwimpfer recalled the days when Post Office requests for new technology were controlled by Treasury, which ultimately stifled progress because of its accounting procedures. "We'd do our best to try and put a new telephone exchange in and try and meet future demand but by the time we had ordered and installed the thing, it was out of capacity. That was because we were using historic three-year projections, which was the way Treasury

allocated funds. You had to prove your case and they weren't prepared to take any risks beyond your last three years of projection. So we as engineers always felt as though we had our hands tied behind our backs. We could never even keep pace with basic demand because we didn't have the funding support," said Zwimpfer.

Vivienne Smith also wrote about the appalling state of the accounting and financial management systems, and the lack of control the Post Office had over capital expenditure and the growth in inventory. Morris during his review asked for an update on the inventory it was carrying. It took a week to come through and when it did, it had nearly doubled in a six-month period (and "nobody knew!" according to Morris). From March to October 1985 it went from $285 million to $403 million. Most of the millions were tied up in telecommunications equipment – telephones, PABXs, and cable – waiting to be installed. Worse still, because of the long wait, when the time came to install some of this equipment, the technology had passed it by. "They took it to the tip and dumped it. I thought the whole thing was a real indictment, partly of management and partly of the government, its owner," said Morris.[43] The 'Mason-Morris Review' recommended splitting the Post Office into three separately managed businesses. The government agreed to implement this within a year.

3

Number 8 wire networks

Patchwork quilt of protocols

> We were a bit mystified when an early email mentioned that we could use 'the Internet' to get to some resources. What was the Internet? It was then we found out that the network of computers in the US that we were connected to was being called the Internet. Tony Dale, support consultant for Canterbury University's Information and Communications Technology Department

The NZPO failed to tune in to the hum coming out of universities and scientific establishments in the United Kingdom, United States, and New Zealand's own research organisations and campuses. Exponential growth in telephone use and burgeoning demand for data circuits should have sounded an early warning.

The government, it seemed, had become complacent about maintaining and upgrading the core telecommunications infrastructure. Telecommunications was no longer the prestigious government portfolio it had once been. It was handled largely by more junior ministers and investment had begun to tail off. By the mid-1980s there was massive congestion on the Post Office network. In Auckland the exchange was verging on collapse and across the country there were frequent network crashes. Limited by government control over what it could invest, the Post Office became increasingly inefficient. There was little incentive to improve. After all, it had a complete monopoly on all the activities it was engaged in, from delivering mail and telegrams to phone, data services, and faxes.

The government began to look at ways to improve the services offered to domestic and business customers. It embarked on a series of reforms to try to place this foundering but essential business on a more commercial footing. Under the SOEs legislation the Post Office division that dealt with telecommunications was overhauled in preparation for sale.

While large corporations and government departments were learning about the limitations of the proprietary protocols that linked their growing armoury of mainframe and mini computers, IT staff and computer science experts across the nation's universities were still trying to figure out how to network their disparate systems. Various clumsy attempts had been made to connect computers,

departments, and even university campuses as early as 1975. From 1980 the old Burroughs B6700 mainframes in New Zealand's universities were gradually replaced with more incompatible equipment, including systems from Prime, DEC, and IBM, further frustrating the vision of a university-wide network. When the heads of the computer services or computer science departments got together, talk would inevitably turn to how to maximise the use of existing resources and share information. The boffins knew there must be a better way and without any government input, continued to innovate and experiment.

WAN, and any form of national or international connectivity, was still very much a store-and-forward business. A user would send a message, which would be uploaded when the computer next linked to a remote host. When the destination computer next logged in, possibly using an incompatible system, the file would complete its journey. The theoretical network that might one day expand to embrace the world was most often referred to as WorldNet.

COLOURED BOOK CONFUSION

Research-based networks were emerging in the United States and United Kingdom. They were initially built for closed communities of scholars or academics and were largely incompatible because they used different communications methods. For example AT&T's wide dissemination of the Unix operating system had given rise to the Usenet news service, based on its built-in UUCP communication protocols. New Zealand universities, aware of growing offshore repositories of valuable research data, often had magnetic tapes of content mailed to them.

In 1981 Ira Fuchs at the City University of New York and Greydon Freeman at Yale University had come up with Bitnet[2], which linked academic mainframe computers. It was a point-to-point store-and-forward network with email messages and files transmitted in their entirety from one server to the next. Bitnet's network job entry (NJE) protocols were used for the enormous IBM internal network known as VNET, which originally ran at 9.6kbit/sec. The protocols were eventually ported to non-IBM mainframe operating systems and became widely implemented under DEC's VAX/VMS operating system.[3]

Janet, a UK Government-funded computer network dedicated to education and research, had been developed by British university networks in the 1970s. Hosted on an X.25 research network, it went live in April 1983 with 50 sites accessible at line speeds starting at 9.6kbit/sec.[4] Janet helped standardise the Coloured Book protocols that made up the first complete X.25 standard. The UK-centred approach resulted in host names that were opposite in layout to those determined by researchers on the ARPANET Internet project; for example, uk.ac.universityname.comp rather than science.universityname.ac.uk. This made it complex and confusing for those who wanted to access both. Many were convinced that Janet, loosely based around the emerging layers of the open systems interconnect (OSI) seven-layer communications model, would lead the way as an international standard.[5]

"OSI is an International Standards Organisation (ISO) standard for worldwide communications that defines a framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, proceeding to the bottom layer, over the channel to the next station and back up the hierarchy. At one time, most vendors agreed to support OSI in one form or another, but OSI was too loosely defined and proprietary standards were too entrenched. Except for the OSI-compliant X.400 and X.500 e-mail and directory standards, which are widely used, what was once thought to become the universal communications standard now serves as the teaching model for all other protocols," ***PC Magazine (US) Encyclopedia.***[6]

In the early 1980s research at the US-based ARPANET was tightly contained until it was refined in a peer group process and its protocols and utilities began to be distributed more widely. Word was soon out that the ARPANET experiment had succeeded and visionaries across the IT, academic and science and research communities were logging on as fast as they could muster the resources. Soon the fledgling Internet became a victim of its own success, with more computer 'hosts' linked than ever envisaged. By 1984 there were 1000 hosts, mostly in the United States, and the volume of traffic was growing exponentially, largely due to email. Some even predicted the whole anarchic system was on the verge of collapse.

In 1984 when the British government launched Janet to serve its universities, the US National Science Foundation (NSF), determined to make Internet available to all 'qualified students,' established NSFnet. International networking was clearly headed for the mainstream; the only uncertainty was which of the evolving protocols would be the first to reach critical mass.

TCP/IP THE CHALLENGER

In the United States there was no question. The use of TCP/IP protocols rapidly became mandatory. It had been adopted as a US Defense standard in 1980, enabling technology sharing for research and development and operational purposes. On 1 January 1983 a carefully planned transition took place, shifting the Internet away from its military origins, with all hosts required to convert simultaneously to the TCP/IP protocol. Lapel buttons declaring: "I survived the TCP/IP transition" appeared spontaneously across the Internet community. The NSF invested major funding in faster computers and backbone networks. Every government agency jumped on board, and gateways were quickly established around the world. The Internet was growing up and out.[7]

US Government agencies shared the cost of 'common infrastructure' such as undersea and international connections and gateways. NSFnet now had shared infrastructure agreements with other scientific networks (including ARPANET), promising there would be 'no metered costs.' It agreed to support the Internet Activities Board (IAB) in future research, provide the backbone for the US Internet service, and purchase five supercomputers to service the traffic. The first computers delivered 56kbit/sec[8] but access excluded any "purposes not in support of research and education."

The creation of NSFnet had an immediate and dramatic impact, removing the bottleneck from the original Internet system and encouraging a major upsurge in use. It had taken a decade for the Internet to grow from four computers to 1000. By 1986 there were 5000 connected hosts and a year later that number had skyrocketed to 28,000. The decision to exclude commercial users sparked an upsurge in private investment and development in the US network infrastructure. As businesses realised they lacked the knowledge required to leverage the TCP/IP software bundled with their computers, they began taking on skilled people from academic and research backgrounds.

From 1985 mainstream computer vendors began looking at their own networking products with a view to making them more interoperable. In 1987 UUNET, the first subscription-based commercial Internet company was founded.[9] While the Internet was gaining rapid ground in the academic and science sectors it remained a mystery to most due to its arcane disciplines, complex code, and complicated interface and commands. Finding information in this growing maze of data was not for the uninitiated, although there were a growing number of tools designed to make it a little easier for those who could grasp the concepts. There were few options in the way text-based content could be viewed: a black or green screen and one typeface, Courier. Downloading data was painfully slow. Newsgroups, where like-minded, certainly technically minded people could confer with each other, and file transfer protocol (FTP) downloads quickly became the killer applications.[10]

ADDRESSES OVERLOAD ROUTERS AND GATEWAYS

As PCs, workstations, and local area networking became available in the 1980s the Internet began to spread to the desktop. Ethernet, developed by Bob Metcalfe at Xerox PARC in 1973, became the dominant network technology, blossoming from a few time-shared hosts under the original ARPANET model to enabling national, regional, and LANs to interconnect.

Until the introduction of domain name servers (DNS) in 1984, each host computer was assigned a name. There was one master list of all computers and who was responsible for them. With a limited number of hosts it was relatively easy to maintain a single table of host names and addresses. With a larger number of independently managed networks connecting, a better system was necessary.

The domain name system (DNS) was based on work done by Jon Postel, Zaw Sing Hu, Paul Mockapetris, and Joyce Reynolds, and permitted a scalable distributed mechanism for resolving hierarchical host names into an Internet address. The new system introduced layers relating to types of use, beyond the existing dot.org (international organisation) and country codes that had been allocated, making it easier for computers and people to recognise the different hosts.

As the Internet grew, enormous pressure was also placed on the routers, which functioned like traffic cops, directing and redirecting traffic to the intended destination. A single distributed algorithm was no longer sufficient so a hierarchical model of routing was devised, with an interior gateway protocol (IGP) inside each Internet region, and an exterior gateway protocol (EGP) to tie the regions together. This meant different regions could use a different IGP, based on cost, reconfiguration needs, robustness and scale requirements.

The size of the addressing tables was also growing beyond equipment capability and new approaches for address aggregation, in particular classless inter-domain routing (CIDR), had to be introduced to control the size of router tables.

One of the major challenges was keeping host and client software up to date. DARPA backed Berkeley University in its efforts to modify the Unix operating system to incorporate TCP/IP developments from its BBN software. After some revisions the Unix BSD system releases proved critical in getting the research and computer science community onside and achieving widespread adoption of the Internet.[11]

BECAUSE IT'S THERE

When Auckland and Victoria universities moved up to the next level of mainframe computing with IBM 4341 machines from 1980, they began meeting regularly with IBM technical people to discuss how they might start networking. They discovered that RSCS (remote spooling used for running remote printer files) in IBM's VMS operating system could be made to run mail files between machines. Victoria University went so far as to establish its first campus network based on the RSCS protocols. This opened up the possibilities of connecting to the IBM-focused international Bitnet ("because it's there") community.

"The reason Bitnet worked was the joining criteria. You could join for the cost of laying

the cable to the person you wanted to connect to, but you had to allow at least one other organisation to do the same to you. It wasn't possible to be a freeloader. That was how it quickly spread across all the North American universities," explained Mike Newbery, who by this stage had gone from physics graduate to managing the Burroughs terminal 'network,' and joining the Victoria University CSD.

Newbery had cobbled together an email package, based on his own observations, and technical specifications for a 1976 request for comment posting on ARPANET.[12] Written in the REXX programming language and initially designed to communicate with different terminal users on the old Burroughs mainframe, the software began to be used across the new campus network. While it was easy for Victoria to get into Bitnet because it had the IBM Communications Controller box, it was a little more difficult for Auckland University, which had to tweak code on the terminal multiplexer it had acquired from Yale University to run on its IBM Series I mini computers. This meant Auckland could finally run cheap ASCI terminals rather than using expensive IBM 3270 terminals.

The inter-university link operated perfectly for some time until it raised a political question from those outside the university computing fraternity: 'Why on earth would Auckland computers want to talk to those in Wellington?' "Engineering and computer science people understood the potential, and people were used to having email from the same computer but not at other sites," said former Auckland University head of computing, Nevil Brownlee. "We were all aware of the Internet, and with the VAX cluster we ran from the mid-1980s we had mail forwarding with other sites via Pacnet, with all sorts of tricky gateways into other networks. But the Post Office charged heaps of money per minute for a Pacnet connection."

While he'd helped cobble together the breakthrough technology that enabled the DSIR's computers to interact with the huge GCS mainframes in the late 1970s, Frank March was to dive in even deeper in the early 1980s. His first encounter with networking had been with a large IBM system at the CCLRC Rutherford Appleton Laboratory (RAL) in Oxfordshire. In 1984 he was back at this laboratory on study leave shortly after Janet was announced. He wanted to see how this new development might apply to the DSIR in New Zealand.

Over a six-month period March made himself an expert on the Coloured Book protocols being used in the newly launched British academic network. On the way home he stopped by the laboratories of BBN Technologies (originally BBN) in Cambridge, Massachusetts.[14] The independent research and development firm was under contract to the National Bureau of Standards to do compliance testing for both the ISO's OSI protocols and for the TCP/IP stacks. "I asked them somewhat naïvely, 'And when do you expect TCP/IP and the ISO protocols to converge?' They fell over themselves laughing and said that it would never happen. TCP/IP is the future and the OSI protocols will never amount to anything."

March stood his ground. "I didn't believe them. I thought, they've got to be wrong. In fact when I came back to New Zealand there was a huge debate going on about which way things should go, and Coloured Book still looked good. It was far from clear at the time because there were four or five competing international networks." Coloured Book wasn't easy to understand and he had some reservations, particularly when he stumbled across the TCP, which he understood. It looked very similar to the Australian developed NodeCode, which the DSIR network ran. It was the interconnection protocol (later IP or Internet protocol) that he encountered for the first time at BBN that threw him. "The Brits weren't interested in TCP, and determined to ignore Ethernet and stay with the emerging ISO standards." So he avidly absorbed as much of the TCP documentation as he could.

When March returned to New Zealand in March 1984, he was convinced of only one thing:

Ethernet was going to take over from all the rest of the network transport approaches because it was using integrated circuits for its cards and beginning to be mass produced. All the alternatives used discrete components and cost the earth to connect – about $20,000 per station.

In 1980, when government rules relaxed, the DSIR was authorised to buy a DEC VAX 11/780 system for its Gracefield laboratories, which in March 1981 was linked to the DSIR network. A year later another went into the AMD. Interactive access was provided at maximum speed of 9.6kbit/sec. Internal campus wiring gave local users direct access, while remote users could contend for a limited number of physical ports. "In comparison to the IBM and ICL systems, the VAX was far more user friendly and proved to be extremely successful," said DSIR IT manager Dr Peter Whimp.

According to March few had heard of email, and it was only introduced into the DSIR as an interesting artefact on the side of the VAX operating system. "Only when the second VAX was introduced did connecting the email systems become our priority. At that stage DECnet didn't exist, TCP/IP didn't exist and VAXs did not automatically network. They ran terminals connected to each one, but the idea of connecting two VAXs together certainly wasn't part of the operating system." Once more Kiwi ingenuity came to the fore: if you can't buy one, make one. "We wrote our own system within the DSIR network, which allowed the two machines to exchange information and send and receive mail. When the third VAX arrived email went from an unknown service to essential in 12 months."

While March and everyone else on the team could see the desirability of sending email outside the DSIR, no one was sure how to do it. In fact there was a meeting at Victoria University in 1985, towards the end of his term as DSIR network manager, to discuss computing issues such as setting up a common email system between universities and the DSIR. "I remember somebody said, 'Why on earth would we want to email other universities?' To hear that, at a time when John Hine and his group at Victoria University were experimenting with emailing to North America and starting to get all this news down, flabbergasted me," said March.

UNIX NO IMPOTENT MINDER OF VIRGINS

"Not only was the hardware needed to run Unix too expensive to be within an individual's reach, nobody imagined this would change in the foreseeable future. Unix machines were only available by the grace of big organisations with big budgets: corporations, universities, government agencies. But use of these mini computers was less regulated than the even-bigger mainframes, and Unix development rapidly took on a countercultural air. In the early 1970s the pioneering Unix programmers were shaggy hippies and hippie-wannabes who delighted in playing with an operating system that not only offered them fascinating challenges at the leading edge of computer science, but also subverted all the technical assumptions and business practices that went with Big Computing. Card punches, COBOL, business suits, and batch IBM mainframes were the despised old wave; Unix hackers revelled in the sense that they were simultaneously building the future and flipping a finger at the system." Origins and History of Unix, 1969–1995.[15]

The efforts of those creating the Internet at the University of California Berkeley campus and at the US ARPA research facility had an important parallel in the development of the Unix operating system. In fact the two

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would quickly become inseparable. In the early 1960s computer hardware was extremely primitive, video display terminals were still in their infancy, input was through punch cards, and data was shared by swapping magnetic tapes between machines. The standard interactive device was a teletype machine that printed in upper case on big rolls of perforated paper.

As applications become more sophisticated new features were needed, such as network access, multitasking, and communications between different processes. In existing operating systems these features were difficult to use, hard to maintain, badly documented, and could be activated only by using assembly language.

Unix was the forerunner of systems that would allow a programmer to sit down at a keyboard terminal and compose, reuse code, and test programs directly. Everything the experienced programmer needed was part of the operating system, including the documentation. The very nature of this more elegant system meant that it attracted programmers to explore, comment on, and enhance its operations, thereby growing its capabilities. It all began with programmers at MIT, AT&T Bell Labs, and General Electric, who were determined to change computing by simplifying and expanding the capabilities of operating systems. They were working on an experimental system called Multiplexed Information and Computing Service (Multics), to run on a GE-645 mainframe computer.

When Bell Labs pulled out of the project one of its developers, Ken Thompson, was left without a machine on which to play a game he had developed, called *Space Travel*. The sci-fi simulation involved navigating a rocket through the solar system. While he continued to invest his own time on the platform, poor performance and high costs soon saw him looking for a replacement system to further develop his game and test his ideas on operating system design.

He began rewriting the game in assembly language for DEC PDP-7 mainframe. With help from Dennis Ritchie; later co-inventor of Unix and the inventor of the C language, and other Bell Lab developers, he created a new file system and multitasking operating system for the PDP-7, including a command line interpreter and some small utility programs.

In 1970 the utility programs Thompson and Ritchie wrote to move *Space Travel* from the GE mainframe to the PDP-7 became the core of what was known as UNiplexed Information and Computing Service (UNICS), which quickly morphed into Unix.

Multics had been a huge project, with thousands of pages of technical specifications, and was written before the hardware even arrived. The first Unix code, on the other hand, was brainstormed by three people and implemented by Ken Thompson in two days, on an obsolete machine that had been designed to be a graphics terminal for a 'real' computer.

The first real implementation of Unix in 1971 was to run a word processing application for Bell Labs' patent department and soon became associated with document formatting, typesetting, and communications tools. All the while the operating system continued to be developed on more capable next-generation machines and by 1972 it could support two simultaneous users. The operating systems of the time
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took up a lot of disk space and memory, were written in assembly language, and were specific to different kinds of hardware. After it was rewritten in the high-level C programming language in 1973, Unix became more concise and compact, and it was much easier to create variations that ran on different computers.

In 1974 paper Ritchie and Thompson gave the new operating system its first public outing, describing the 'unprecedentedly simple' design and reporting more than 600 Unix installations. Research labs and universities all over the world clamoured for the chance to test the new operating system. Under a 1958 'consent decree' in settlement of an antitrust case, AT&T (the parent organisation of Bell Labs) had been forbidden from entering the computer business. Technically this meant Unix could not be turned into a commercial product. In fact the conditions required Bell to license its non-telephone technology to anyone who asked. Ken Thompson quietly began answering requests by shipping out tapes and disk packs, which according to legend, each had a note signed "Love, Ken."

Universities and research institutions began to rapidly learn about and deploy the operating system, which solved many of the problems of networking and communications they had been experiencing in their computer departments. The most influential of these development hot beds was the Berkeley campus of the University of California. Unix research had begun there in 1974. Enthusiasm for the new operating system was given a substantial boost when Ken Thompson taught there during a 1975–1976 sabbatical. The first BSD release came from a lab run by then-unknown graduate student Bill Joy in 1977. By 1980 Berkeley was at the hub of university networks that were actively feeding research back into their own version of Unix and to Bell Labs.

When anyone developed a new feature they would typically use the same tools and enable the application program interface to access those features. This was a completely different approach from proprietary operating systems, where programmers needed different tools and capabilities that would be unavailable to others wanting to develop an application for that operating system.

In 1980, when DARPA needed a team to implement its brand-new TCP/IP protocol stack on the VAX under Unix, it chose Berkeley Unix as the platform, largely because its source code was available and unencumbered.[16] This was a major turning point in the evolution of Unix and the various tools that improved connectivity, thereby assuring the success of the nationwide and global goals of ARPANET, and TCP/IP as a communications protocol for the future.

In 1984 the University of California at Berkeley released version 4.2BSD, which included a complete implementation of the TCP/IPNetworking protocols. Systems based on this and later BSD releases provided a multi-vendor networking capability based on Ethernet networking. Network support included remote log-in, file transfer, electronic mail, and other features. As Unix became the preferred operating system for different types of computers, Unix networking allowed them to share data and build large distributed systems.

As Unix began to gain ground from the mid-1980s a new level of openness was created. You could port applications

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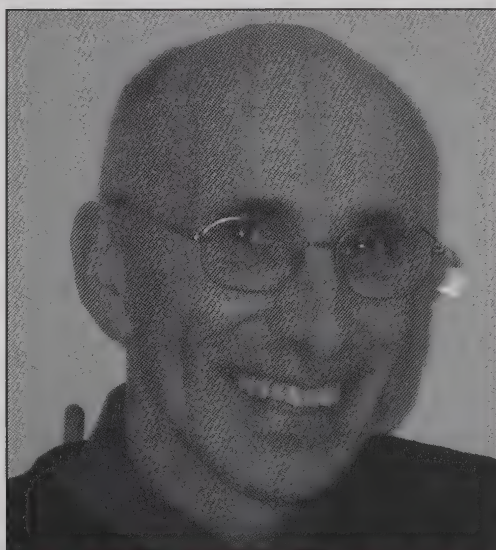
across different systems with minimal changes. In other words a third-party developer could create a single Unix version of their software and have it run across multiple hardware types, rather than having to create several proprietary versions. This not only facilitated networking and interoperability, it helped bring down the cost of software, enabling a growing number of businesses to take advantage of open computer systems.

Application portability and ease of system programming began to significantly change the nature of network computing. When Bill Joy's Sun Microsystems added network file system (NFS) to its systems, the field for connectivity was further broadened and a number of new generation mini computer vendors began delivering their own iterations of the now commercially popular operating system.[17]

CANTERBURY CONNECTIONS

Around 1982 Rob Harrington, a Canterbury University engineer and a member of the board of the local branch of Digital Equipment Corporation Users Group (DECUS), established a dial-up email link with a DECUS counterpart in Sydney. At the heart of the system was a Pascal memo distribution facility (PMDF) package that could manage mail and figure out where to send it. Using acoustic couplers (early modems), a link was established with the DEC mail hub across the Tasman, which enabled DECUS board members to dial in and exchange messages. "The board was really pushing the parameters in terms of what was available in achieving that link," recalled Harrington. Canterbury had replaced its old Burroughs mainframe with a Prime system, which talked X.25 but "it was a dog of a machine." Then the engineering people bought a Microvax and converted the campus network to Ethernet. Things got a little simpler when the Post Office launched Pacnet because this was compatible with the X.25 communications protocol that the DECVAX computers used. This became the preferred means of exchanging messages between DECUS members locally and in Australia.

Even more entrepreneurial, however, were the efforts of the Computer Science Department under Dick Cooper, who established one of the earliest international links for news and email. In 1985 the Computer Services Centre established a connection from its Prime 750 computer to the Post Office Pacnet X.25 network at 10kbit/sec. Robert Biddle, a PhD student in the CSD, set up a crude email system that required the user to log in to other university computers to send mail. The plan was that everyone would eventually go the Coloured Book way. However Biddle, with help from programmers Ken Lalonde and Alan Bowler,



Canterbury University engineer Robin Harrington, established a dial-up link with Sydney in 1982.

Taking Unix mainstream. NZ Unix Systems Users Group Inc (NZUSUGI) board elected at the 1986 hui in Rotorua in 1986. Front Row (L-R) June Toose (Vice President), Ian Howard (President), Rob Pascoe (Treasurer), Back Row (L-R) Stewart Sergeant, Tom Winiata, Arjen de Landgraaf, Keith Hopper (Secretary), John Dobson, John Kelly, Simon Molloy, Roger Hicks (Past President). The group later became known as UniforumNZ and had a big part to play in commercialising Unix and its related TCP/IP tools which gave IP a groundswell of support among major businesses in New Zealand. Roger Hicks archive.

used the connection to log in to the Mathematics Department at the University of Waterloo in Canada, where he had been a student. "I made a crude interface that transferred mail between the Prime and Waterloo and beyond." [18]

In 1986, the Computer Science Department spent its furniture budget on a DEC VAX 750, installed Berkeley Unix (BSD4.2) and named the system 'Cantuar.'[19] A program running on the VAX interacted with the Prime 750, so Cantuar could also use Pacnet to log in to offshore UUCP networks. "This was a really hacked connection, requiring special daemons[20] to communicate using a weird protocol, to get around the very weird Prime X.25 interface. But it worked, and we used UUCP to connect to anything else that talked X.25; because of the Prime, however, we could only connect out and not in," recalled Biddle. The Pacnet (X.25) cost structure had one rate for New Zealand, another for Australia, and another for the rest of the world. So UUCP connections were made of these zones including North America and Europe. Canterbury ended up with UUCP connections to the University of Waterloo in Canada, Victoria University in Wellington, Melbourne University, and the Mathematical Centre in Amsterdam.

The connections were in regular use for some time and further temporary links were made to Christchurch companies, to Lincoln College, and Hong Kong. "The Hong Kong connection (hkucs) was established because we had a long-term visitor from Jinan University in Guangzhou. At the time Jinan had no outside network connections so it seemed like a neat thing to do. However we had

great difficulty using the telephone connections to establish that link so we ended up terminating in Hong Kong instead,"[21] said Biddle.

Tony Dale, support consultant for Canterbury's Information and Communications Technology Department, said because the Pacnet connection only ran overnight, email and news was only received once a day. "If you wanted a specific file you could do an email request to a server and the file would be sent back via email. It was expensive, however, and after a couple of years on-line we were spending over $1000 a month just to get a few megabytes of traffic. We were a bit mystified when an early email mentioned that we could use 'the Internet' to get to some resources. What was the Internet? It was then we found out that the network of computers in the United States that we were connected to was being called the Internet."

Shortly after the main UUCP links became stable, Biddle recalled Canterbury made an entry in the worldwide UUCP routing maps. "I got a message from a US military base somewhere on the Pacific Rim, from someone who had seen our entry and realised we were close to the US installation at Christchurch Airport, used for the US Military Airlift Command. He said that he was involved in shipping things through there on their way to Exmouth, in Australia, which I found out is a US submarine base. He wanted to know if we would allow people at the Christchurch base to have access to our system, so he could communicate with them about these shipments. He intimated he would ship some things to us in exchange. The scheme didn't go much further, although I have always wondered what manner of things he might have arranged to send us."

Victoria University was not only a UUCP site, it was a node on the Australian SUN-III network, a Sydney University initiative with its own homegrown protocols and an X.25 link. VUW used this connection to get news, and in turn Canterbury got its UUCP news from VUW's Computer Science Department. "It was frequently flaky, because VUW didn't have X.25 on their machine either, and we had to connect via daemon on a VMS/VAX in the Computer Services Centre. We also got some newsgroups from Waterloo and Melbourne when these weren't picked up by Victoria, or when the faster speed was important to us," said Biddle.[22]

During 1985–1988 there was much confusion about email and news. Lots of people wanted connectivity but university computer centres insisted on following the UK Coloured Book or Spearnet (South Pacific Educational and Research Network) models, or approaches encouraged by various computer companies. "At Canterbury, our department felt it couldn't operate email for the university as a whole; that was the Computer Service Centre's job. Yet they didn't see the world the way we did, so it was pretty frustrating. At the same time the Post Office was trying to sell its Starnet service, which originally involved each user having X.25 to connect to a central machine in Sydney. Some government offices got Starnet and regarded it as a luxury, even reprimanding people for using it for non-urgent business. When I explained that it should be 'cheaper' than mail, most people just didn't believe me. Then fax machines came along and made things even more confusing," said Biddle.[23]

A LIGHT BULB MOMENT

After struggling with the old protocols and piecemeal attempts at networking at Victoria University, where he'd lectured in computer science in the late 1970s, John Hine had taken research leave to spend a couple of years at the University of Connecticut. His 'light bulb moment' came shortly after arrival, when he sat down at a university computer terminal and fired off an email to a colleague at the University of Illinois in Champaign, Nevada, which was in turn connected to the ARPANET. "I wanted to set up a time for us to get together and a reply came back within a minute. We sent two or three emails back and forward and I thought, 'if we had this kind of network connection it would change the way New Zealand research works.'"

At the time the standard way to communicate with overseas colleagues was by letter, which took at least a week to arrive. A response would not be expected inside a month. "I could see this reducing from months to minutes." Despite his enthusiasm it still took two and a half years from his return to New Zealand to convince those in power to allow his department official access to international email.

"When they created my position as head of the Computer Science Department in 1984[24] they had allocated $5000 for equipment, but when I got here I discovered it had all been spent on a PDP-8. You couldn't really complain because that's what we used to do the networking," said Hine. The PDP-8 was the first successful commercial mini computer, produced by DEC. Launched in 1965 it was the first widely sold computer in the DEC PDP series, with advances in technology including I/O (input/output), software development, and operating system design. The earliest PDP-8 model (the so-called 'Straight-8') used discrete transistor technology, packaged on 'flip chip' cards and was approximately the size of a compact refrigerator.[25]

With a network now in place across Victoria University campus in Wellington and a link with Auckland University finally connected in 1985, using the old 4800kbit/sec modems from the earlier KiwiNet experiment, and a leased line from the Post Office, it was time to expand.

Two meetings were held in 1985, attended by representatives of the New Zealand universities, DSIR, and the Ministry of Agriculture and Fisheries (MAF). The first official gathering, during the Telecommunications Users Association (TUANZ) seminar on 25–26 August, was essentially a working lunch to discuss university networking but resulted in a series of follow-up discussions over the next week. Although the ad hoc group of university computer and communications luminaries had invited government departments to become involved, no interest was shown.

John Hine presented his own research and kept a record of discussions, which centred on the options available for a national university network, the likely costs of doing this via Pacnet or leased line and the various protocol and standards issues that made the process rather complex. He warned there wasn't much of a future for ether Bitnet or Coloured Book protocols, that international standards for the UK's Janet based around Coloured Book could still be ten to 15 years away, and that TCP/IP, specified by NSF for ScienceNet in the United States, was likely to be around for a while.[26]

The second meeting, a one-day event in November 1985, was called to co-ordinate the development of a national research network. The only agreement reached was on a common protocol, the Coloured Book suite, which was heavily influenced by the development of Spearnet in Australia and used by Janet. Spearnet was originally conceived in 1984 but was not officially announced until a seminar in March 1986 after financial backing had been cemented with DEC. New Zealand jumped the gun, and while the DSIR and MAF had attended the original meeting and agreed on the use of the Coloured Book protocols, neither joined Spearnet. The DSIR had its own experimental implementation, increasingly dominated by DEC VAXs. In 1985 an X.25 interface was added to allow DECnet to share the network bandwidth with existing network traffic.[27]

MAF had its own connections to government computing centres, including Fisheries Research and Victoria University. Its private X.25 network connected DEC VAXs using DECnet, Prime mini-computers on PrimeNet protocols, and a Pyramidst machine using TCP. Since each system had a different transport level protocol, the only service available was remote log-in. MAF was gradually adding more users to its internal network, including LANs, and in 1987 hadn't yet joined the fledgling national universities network. MAF had decided non-academic licences for the software on its Prime computers were too expensive, so when it began to be adopted during 1986, Spearnet became solely a university network.

HICKS ADVOCATES UNIX

In the early 1980s Roger Hicks was technical manager for Interactive Applications, a small Auckland software house that specialised in accounting systems on early CPM and MS-DOS computers. He and its technical director were asked to find an operating system that would get the company involved in multi-user systems. Networking was virtually non-existent at the time.

Hicks had heard about Unix and after discussions, ended up in a meeting with Keith Hopper, senior lecturer in computer languages and standards at Waikato University. Hopper recommended setting up a users group to discuss its role in business computing. An ad hoc committee was formed and a handful of people began meeting to discuss various computer problems. While many of the international groups such as Usenix were very techie, the resulting NZUSUG, formed in 1985, aligned itself with and gained strong support from the more business-focused UniForum. A conference was planned to determine the wider interest in Unix and its applications in academia, research, and business.

Hicks had been on a business trip to a Unix conference in the United States in 1985. Around 3000 people had been expected but 9000 turned up, and the hotel was bursting at the seams. It was there that he found support from the international UniForum group. It surprised everyone how many people from the business community had turned up at such a technically focused conference. "In fact there was even a formal complaint made to the organisers that some people were wearing suits. I ended up bulldozing my way in and getting introduced to the people at Bell Labs. I was told if I turned up at the door and asked them about sending someone to speak at our forthcoming conference in New Zealand they would look kindly on it. The fact was we had no money, we just said to companies like Bell, 'Why don't you send a speaker to New Zealand at an exorbitant cost to yourselves and we'll show them a good time and waive any charges if they come to the conference.'"

Hicks' original discussions at Bell Labs were with an Australian, who saw the invitation as an opportunity to head home for a trip. However just before the New Zealand conference started there was a phone call from Bell Labs: "Would it be all right if Ken Thompson comes as well? He doesn't want to be speaker or part of the programme; he wants to keep a low profile." Of course Hicks immediately agreed. Thompson was one of the founders of Unix, and behind its further development as a mainstream operating system. "Here was this guy who was used to being mobbed by techies everywhere, sleeping in the students' accommodation at Waikato University and sitting in the back at the conference. Basically we just sat and drank Lion beer with him afterwards and people left him alone. After a couple of days he said to us, 'I've never been to a Unix conference where I haven't been swamped by people and haven't been asked to speak.' We explained that was the Kiwi style. He said he didn't want to speak and we were fine with that. Thompson then turned around and said 'Well, I would like to speak' so we found a slot in the programme for him," recalled Hicks.

"Once the significance of this guy, who probably would have earned a Nobel Prize for computing if there had been one, was explained to the academic staff, they were pleased to have him and wanted to meet him. Suddenly the university started to take notice of what we were doing." Thompson returned at least twice to continue his newfound relationships in New Zealand.

Hicks, the second chairman of the Unix Users Group,[28] which quickly morphed into the local arm of UniForum, had the job of sharing information, building relationships within the IT community, and giving "techies a reason to get together and have fun." But it wasn't only the techies who turned up. Typically they would be surrounded by a group of marketing people who needed to understand the way they were thinking. "To sell a product or an idea it's the technical people who have to validate it and say whether something could or couldn't be done, and ultimately that's the way it worked. At those

John Houlker, brokered the deal with NASA for a full international connection into the US Internet backbone. Photo: Waikato University.

conferences the vendors began to look at how they could implement their applications across different platforms."

Initially there was strong resistance, particularly from larger vendors such as IBM, Digital, and Hewlett-Packard, who were only interested in their proprietary operating systems. Early Unix variants came in through specialised mini computers and workstations, including Sun Microsystems, NCR, Data General, Tandem, and Silicon Graphics. Hicks believes UniForum had a major impact on the adoption of Unix by local business.

He recalled setting up access to UUNET for a company in Auckland that wanted to exchange emails and swap software with its parent company, a supplier in the United Kingdom. "They had been sending floppy disks by post and it was taking a week or two to turn around. They asked me if there was an easier way of doing this. It wasn't as robust as it should have been; there were problems with the software and operating system which meant the automatic dial-out every night didn't work sometimes, but these were very early days," said Hicks.

"Instead of username@machine.whatever the email address actually had the route specified in the email so you'd have machinename!machinename!machinename!username... and it would send it from each machine down the list. So my machine would send it to the first one on the list, which would rip its name off and send it to the second one on the list and so on. So this was called bang-path addressing which was used before there was any routing," he recalled.

WAIKATO JOINS CSNET

At Waikato University John Houlker had begun to show an interest in how the country's universities could make better use of local and international network resources. "One of my early tasks was looking at the campus connections and weighing up what we should do about a local area network. This was at a time when Ethernet was emerging and there was controversy about whether Token Ring[29] was going to become the standard. One view was that since IBM was behind Token Ring it would ultimately swamp what everyone else was doing. Some universities were hesitating but the evidence I had was that Ethernet looked pretty good and so I was involved in establishing the early Ethernet around the campus," said Houlker.

After his early involvement using Ethernet and X.25 communications on campus, he moved from part-time-programmer-full-time-student to full-time programmer and staff member. PCs were still on the horizon and everything was focused on centralised computing. A major step towards improving communications speed was the replacing of Ethernet trunks around the campus with glass fibre. "That was driven by some major problems we had with lightning which was striking the copper Ethernet trunks and blowing up equipment, causing it to short out all over the place and leading to great damage and delay."

At the time there was no clear direction for university networking and no shortage of possible options. Auckland and Victoria universities wanted an academic research network with

Bitnet protocols in addition to the Unix-Unix protocols. The ISO-OSI Coloured Book argument continued, and there was strong interest in what was happening at universities in Australia, the United Kingdom with the EARN (European Advanced Research Network) and the Unix-to-Unix and TCP protocols being used in the United States. Houlker and other pioneers of the time including John Hine and Neil James were intimately interested in what this meant for university networking as a whole, so they immersed themselves in the technical papers and in open discussion about the way forward.

On the shortlist were UUCP, RSCS protocols, Coloured Book, and TCP/IP plus other proprietary vendor specific approaches such as PrimeNet and DECnet. At the time DEC was claiming its network would merge with ISO-OSI. In fact it was all getting rather complex, with universities having to co-ordinate various protocols for different networks and services across various departments. A Reuters 'Business Briefing' information service required its own leased line and another line for the New Zealand Press Association (NZPA). The National Library had its IBM SNA network to access bibliographic records, which required separate connections into each university. Houlker took it in his stride, aware that being up to date on all the options was part of the job.

He had been keeping a close eye on innovations coming from ARPA, particularly from 1986 when the NSF made a huge grant and created the NSF backbone (NSFnet). Concurrently the UK-based Janet network had taken off, and the NZPO was starting to widely deploy X.25 packet switching over its Pacnet public data network. The advice from the so-called experts at NZPO was that X.25 would become its dominant platform for data networking and the price was destined to drop and become even more economical than leased lines. Waikato and several other universities were already using Pacnet and several were using proprietary DEC software over X.25. "The cost side of it definitely looked bad. We were paying for all these different services and specific circuits and beginning to wonder whether this was such a great idea. While Telecom was insisting X.25 was the way to go, and that it would become a much cheaper route, the software for running networking over X.25 was thin on the ground and expensive, especially for TCP/IP."

Houlker, Hine, and other senior people in the university networking arena had a sense this TCP/IP stuff was probably more important than they realised but running it on X.25 was problematic. In fact X.25 was hardly used in United States. "What we were witnessing was more or less a transatlantic divide. On one side in the US you had Department of Defense-led projects on TCP/IPNetworking that used raw data circuits and route around or avoid specific telecommunications carriers. With this approach you could access unused capacity from multiple telcos and build a network on top of it. On the other side of the Atlantic, in the United Kingdom at the Rutherford-Appleton Laboratories and other locations, British Telecom was backing a packet data network structure which had very defined customer interfaces. That's what X.25 is; it's not a specification for a packet routing protocol, it's a specification for the service interface, around the idea that you'd have to have a telco service provider and then a data network customer," Houlker explained.

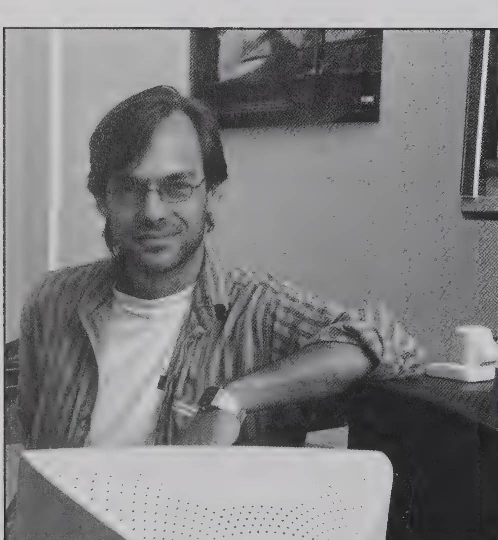
It was clear the NZPO was loyally following the United Kingdom and Europe, believing X.25, Coloured Book, and OSI stack, would all become part of a ratified international standard. Houlker began speaking to his peers in the United Kingdom and managed to get a good deal on the software needed to get a network up and running. He even brought out an expert to help build a gateway to translate email from the Coloured Book protocols to the other networks being used at Waikato. "We had some hard decisions to make and with some reluctance went down the Coloured Book route thinking this worked best with an X.25 national network." In Australia similar approaches were made so there would at least be an easier connection with universities there and in the United Kingdom.

Canterbury University was still dialling up Canada and Melbourne. Victoria was using the Unix UUCP mail and newsgroup utilities to connect to Sydney and to Canterbury. While there had been various, often clumsy, gateways into and out of the country, some dating back to the 1970s, none qualified the user for an Internet domain name. Not one to accept a single solution to a complex problem, Houlker began looking more closely at the US Computer Science Network (CSnet). In late 1985 he had discussions with CSnet founder and Internet hero Larry LandWeber, at the University of Wisconsin, a key node on the NSFnet backbone. One of the briefs of LandWeber's CSnet International Liaison group was to help universities who couldn't afford to connect to NSFnet, including international participants. A Unix gateway onto the backbone had been established in Maryland, and there was a big debate about whether commercial organisations should be allowed access or whether the Department of Defense should partition off some of the Unix-to-Unix stuff that was in the private sector.[30]

"CSnet was kind of a royal road for us into the Internet domain. They did go to some lengths over a couple of months to check who you were and what you were doing. Larry LandWeber was held in some esteem, so I imagine once he had approved us, Jon Postel at IANA (Internet Assigned Numbers Authority) would have accepted we were a trustworthy organisation," said Houlker. An email was sent confirming the arrangement with Waikato University as the dot.nz country code domain holder. Technically the New Zealand top-level domain dot.nz, largely proposed through the Janet and OSI networking regimes, was assumed by the New Zealand vice chancellor's Standing Committee on Computing. When Houlker struck the arrangement with CSnet, the country code effectively fell to him as gateway manager at Waikato University. "We weren't directly connected to the Internet or using TCP/IP. We were running special CSnet software for dial-up email; in fact we used a Pascal version of MMDS (multimedia distribution facility) that was a little easier to use and more flexible than the UUCP software." CSnet ran the DNS for the various zones including dot.nz, and mapping the MMDS protocol to IANA's DNS.

The DSIR's AMD had earlier applied for a link to CSnet but was rejected as it would only connect to universities. It had to wait for Waikato to get its connection up and running, as did a number of universities keen to share the connection. However there was a frustrating wait over several months before problems were ironed out.

Houlker was trying to make the most of the opportunity and keep costs down. He modified the software to run on X.25 rather than ordinary dial-up so it would be easier to manage and cheaper for international voice calling. "I certainly had a tough time being so far away from the University of Wisconsin, which had some of its managers based in Boston. It took two months just to change a password. Their set-up was wrong and it took a long time to convince them to change it. They were claiming my changes to the software were faulty and I felt that they had just misconfigured some stuff at their end. Eventually we got it going."



Mark Davies, Victoria University, Computer Science Department technician.

BATTLE OF THE PROTOCOLS

While the use of the Coloured Book protocols gave the universities immediate access to Janet, Spearnet, and related networks, this limited any further adventuring into cyberspace.[31] Spearnet failed to develop as hoped, largely because the successful Australian-based ACSnet (Australian Computer Science Network) was already delivering many of the functions users were seeking.

To gain access to a larger international community, Victoria University had initiated connections between its Unix systems, including a DEC VAX11-780, which was participating in the X.25-based Spearnet, to connect to other DEC machines. It managed to link the VAX to the IBM using the same techniques for connecting with the IBM mainframe at Auckland, and in the process discovered its in-house-developed email worked across both. It also connected to the Unix networks at Melbourne University and with the University of Calgary in North America. Ultimately it achieved a link with the main UUCP hub on the West Coast of the United States. This provided access to electronic mail and Usenet. Some of the hosts on the network used VAX/VMS machines with connections to Telecom's Pacnet and accessed Digital's PSI mail to communicate with similar sites.

Victoria University technician Mark Davies had a huge influence on the way things developed, building the Computer Science Department's network and the software and systems that connected the academics through the campus-wide network. Davies had a computer science undergraduate degree from Victoria and had never left. "In computer science there's a strong interest in connecting things and trying to get past the tyranny of distance to find out what's going on in the rest of the world. I was keen to grow my knowledge and having access to Usenet meant having competent, intelligent people to talk to about interesting things," he said.

One of Davies's interests was accessing as much free software as he could find and making enhancements before firing it back to the broader user community, who were then able to make further enhancements. He was a heavy user of the emacs editor,[32] and had a Lisp interpreter,[33] which he used to add features. For example, the pre-eminent mail distribution package at the time, Send Mail, contains code written by Davies as does Bind.[34] "I would find the limitations and fix it. In those days we would take an entire Usenet dump every couple of months so we got 'a dose of the world at a time,' delivered on half-inch disks."

With a connection to Sydney, Melbourne, and Canada and access to international email and Usenet, Davies and others in the Computer Science Department had a sense they were tuning in to the wider world, even if it was through three-inch magnetic disks or email that took days to be delivered through multiple computers. He'd kept a close eye on the Berkeley Unix developments in dial-up networking. "We knew the Internet was out there – essentially ARPANET in the United States with links into Europe – but the high cost of international communications was prohibitive and it seemed as though it wasn't going to get to New Zealand in our lifetime. So we connected our own little IPNetworks over Ethernet through Unix systems."

The local Unix group had contributed a huge hard disk on permanent loan to Victoria University to handle the store-and-forward communications with Melbourne University. In turn Victoria University, which was beginning to have much closer contact with the business community, turned up at the Uniforum conferences and took a commercial booth. "We were consulting in a way, although it was more like preaching. We were definitely passionate," explained John Hine. By February 1986 Victoria began providing links to the DSIR and MAF networks. By mid-year Waikato, Massey, and Canterbury Universities had joined in, using the US links for mail and access to newsgroups.[35] Tony McGregor, who was working at Massey's computer centre at the time, said the first UUCP link out of Massey was to Auckland in 1986, using the leased voice circuit put in place to reduce the cost of toll calls. "We got access to the circuit in the evenings. I think we also,

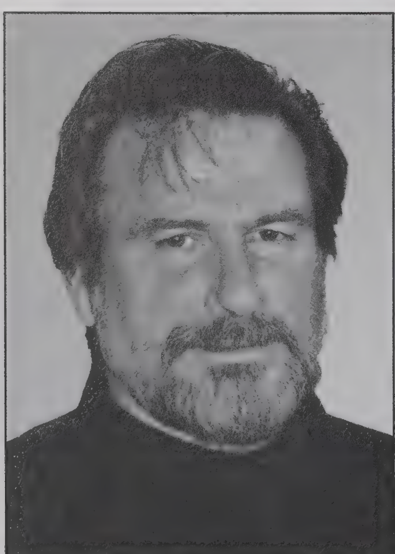
briefly, had a link to Victoria over a similar circuit. It took me months to organise because of a senior manager who said: 'There will never be computers connected to my telephone exchange.' Our victory was short lived because he imposed daytime toll rate charges on us and effectively killed the project. We made the DSIR link a few months later." The Massey node was a 68000-based Unix Altos computer.[36]

A year later the AMD of the DSIR in Wellington and Auckland, Fisheries Research in Wellington, and ICL Computers in Wellington were on the Unix network. By February 1987 every university except Canterbury had implemented the Janet Coloured Book protocols with electronic mail based on the Grey Book mail protocol. Blue Book was for file transfer and Yellow Book was the transport layer with the carrier layers running over the Post Office Pacnet X.25 network. Massey University implemented the network on its Prime computers while other universities had implemented the protocols on Digital VAX/VMS systems. Canterbury ordered a VAX/VMS so it could join the network by mid-1987.

GATEWAY TO MANY PATHS

As a compromise, or simply because they could, the mail gateway at Victoria had now expanded to embrace the potpourri of protocols – Spearnet, ACSnet, DSIRnet – which now linked most of its DSIR sites around the country and the Unix network. Waikato University created a mail gateway between Spearnet and CSnet. Victoria's now comprehensive mail gateway service meant it became the first Internet service provider (ISP) in the country, with Professor John Hine and his team the first to introduce a commercial dial-up service.

"We went to the university administration and said we wanted to open up an account for a self-funding project which involved email and UUCP news. They looked at us and didn't understand any of it. We had dial-up links and leased lines at 4.8kbit/sec and 9.6kbit/sec, and international charges were $25 per megabyte, but at only 5 cents for a two kilobit email that was still a lot cheaper than the Post Office could offer with snail mail." Hine said the cost of sending electronic mail within New Zealand was around 10 cents per A4 page; to Australia it was 60 cents and to the rest of the world, $1.20. With no funding available for accessing international research networks, even though it was most often used for legitimate research purposes, Victoria's telephone bill with the Post Office began to escalate. "At one point we had racked up $16,000 in the red."



Frank March, former director of Computer Services at Victoria University

A plan for recovery of costs was put in place but Victoria University had broken the drought. The innovation and determination of the technical gurus at its Computer Sciences and Computer Services Departments had pushed the boundaries where no one had connected before. As well as providing Internet-like connections to the outside academic and research world, and the first major links between universities and research groups locally, Victoria had five organisations in Wellington, including the university itself, the DSIR, and a couple of commercial businesses, prepared to pay for email.

Frank March had applied for the job as director of Computer Services Department at Victoria in 1987, inspired by a report from Professor of Classics, Chris Dearden, who foresaw the pervasive use of desktop computing and how this was about to change life, particularly in the university environment.[38] "It was quite a far-sighted and daring idea at that stage to suggest you might have a computing strategy which resulted in a computer on every desktop in the university. I wanted to be part of this," said March.

Email was the killer application in the DSIR but at Victoria University it turned out to beconnecting desktops to the library. Academics were very keen to find out if specific books were still on the library shelves before setting off on foot to discover someone else had them on loan. The library catalogue was an early on-line service and, according to Hine, did more to speed up networking on campus than anything else further, fuelling the idea of a computer on every desk. "The important part of the vision was that you could be on your desktop and see the local network and the rest of the world, through access to the Internet."

DESKTOP REVOLUTION PREDICTED

Professor Deardon's report was based in part on a two-hour seminar to the university entitled 'A Computer on Every Desk?,' a 32-page discussion paper and questionnaire, and two days of discussions with key university and industry people. It proposed that the university invest in desktop PCs and local and international networking capability as soon as practically possible.

> *Computer technology has advanced, and will continue to advance at an unrelenting pace. It's impact is only beginning to be felt in New Zealand but is already well advanced amongst our trading partners in the rest of the world... We cannot ignore the spread of that technology, nor ignore the needs of the country as a whole. The University has an obligation to be a leader in the field, and not only in the development of new systems but in the everyday use of technology.*
>
> *Research will become more difficult if we are unable to supply the links to the worldwide system of information collection and storage, or keep our researchers in touch with their fellow researchers overseas who will be using the new technology. Victoria (and indeed New Zealand) is being by-passed in the communication highways which already encircle the world, and is missing out on the kind of interchanges that are becoming more and more the currency of researchers in North America and Europe.*[39]
>
> *All academic staff members and most administrative and technical members should have immediate access to a workstation on which they can carry out text and image processing, store and retrieve text, tables of numerical data, graphs and pictures, perform a range of simple calculations, including scientific, financial and statistical analysis. The workstation should be linked to other similar devices, to the central University facilities, and ultimately to the public telecommunications system via a network. Basic printing, plotting and mass storage devices should be attached to this network and distributed around the University in such a manner that each group of users with common interests has direct access to sufficient facilities to meet all normal requirements.*[40]
>
> *Any user with the appropriate authority should be able to communicate directly with any other user, and gain access to any information or computing resource within the University in a reasonably transparent manner. The University telephone system...should be able to provide access to all current and planned public data communications services, and should be capable of ready expansion to meet future needs.*[41] *Careful consideration must be given to the integration of telephone and computer network services. A flexible and comprehensive electronic mail system should be provided to support a wide range of services,*

including for example, the development, maintenance and dissemination of official documents, course information sheets and teaching material, the preparation of articles, research reports and books, the exchange of research information, the arrangement of meetings, the distribution of agenda and minutes and the preparation of departmental prospectuses etc.[42]

At the time of the report the cost of a workstation, software, and networking was likely to be $10,000 each,[43] with an overall cost of about a million dollars.

A national network linking together at least some of the universities in the country is proceeding and the link between this University and Auckland is already functioning. In the Committee's view an immediate aim should be to link all universities into a single network along with, or with gateways to, DSIR, MAF etc. We believe that this University should continue to take the initiative in this area and seek to persuade colleagues in the other universities and in the Public Service of the advantages to be gained from a country wide network. Communication with and the transfer of information from and to other countries is likely to be critical in the future.[44]

SORT OUT THIS MESS

Professor John Hine's 1987 technical report, 'Research Networks in New Zealand,' published by the Department of Computer Science at Victoria University and partly funded by the AMD of the DSIR, was the perfect follow-up document. While Deardon had taken a visionary approach predicting the growth curve of desktop computing right through to the need for ergonomic considerations, Hine's report got down to the nitty-gritty of networking. His disclosures about the painful protocol wars and the thankless task of cobbling together network solutions without any central direction would be a revelation to the wider community, revealing what he and other pioneers in the search for academic connectivity had been through. It also delivered a strong warning about the obstacles ahead.

Released in the summer of 1986–1987, Hine's report set out to identify weaknesses in current developments and assist in planning. "At Victoria we quickly learned the importance of being a member of this international community. It was our view that the ambition of a national university network was not sufficient, we should be aiming for a research Internet, connecting academic, government and commercial organisations," said John Hine.

Coloured Book protocols allowed the universities to construct a heterogeneous network during 1986 running on DEC and Prime equipment, but by the end of the year most had moved to DEC equipment for communications, ironically negating one of Coloured Book's major advantages.

Problems had also arisen with creating gateways to LANs. The Yellow Book transport protocol assumed the underlying X.25 network could establish an end-to-end connection but made no provision for internetworking. In the absence of X.25 LANs on campuses, it was impossible to reach machines not connected to the Post Office's Pacnet.

There was no provision for a name service in the Yellow Book definition, which required each site to keep an up-to-date list of all other sites they might wish to communicate with. Consequently the Grey Book mail implementations were only capable of delivering mail to machines connected to Pacnet, with no way for other machines to get at the addressing information. Thus it was impossible to build a mail relay to interface with campus LANs. While Victoria had created its own relay system, it sometimes caused multiple copies of a message to be sent due to the lack of information.[45]

By 1987 a growing number of research organisations had well-developed networks with increasing workstation-to-staff ratios, giving easier and more frequent access to network services. The

interconnection of those networks had developed in an ad hoc manner and was nowhere near as well established as Australia, the United States, and the United Kingdom. Connection to overseas networks was not widespread.

While many organisations such as the New Zealand Bibliographic Network (NZBN) and INFOS, which offered statistical information about New Zealand, had plans to establish information sources, the ability to communicate with users on other networks was still new. The rules about how to access these services were varied and confusing for users.

Hine concluded that while the country was in the early stages of establishing its own Internet to offer electronic mail services based on DSIRnet, Spearnet, and a Unix network, the DSIR and MAF were headed in a different direction with their DEC-based networks. The dilemma was whether to drop Coloured Book in favour of the emerging TCP/IP protocols already in use at some campuses and becoming available off-the-shelf at relatively low cost. While the favoured British OSI approach was embracing elements of the Coloured Book protocols and gaining ground in New Zealand, there remained widespread confusion about the way forward.

Why would New Zealand researchers, having had a taste of the connected world, not want continued access to computing resources in North America? The growing reliance on TCP/IP protocols would require New Zealand to make a committed change. Hine suggested it was important for research networks in New Zealand to reach agreement on a smooth, reliable, ubiquitous nationwide network for exchanging email. He knew then what many later would take for granted: "It is only a short time from experimenting with electronic mail to becoming dependent on it." It wasn't sufficient for some machine somewhere in the organisation to offer electronic mail.

> *"Local and company networks must support it and must have efficient and reliable gateways to national networks. Users will not tolerate the need to know different address syntax to reach different destinations. The world is adopting a domain approach to addressing electronic mail and it will be necessary for our mailers and our gateways to follow these developments. The electronic mail service currently available should continue to be developed. Particular attention should be paid to the implementation of domain addressing and the construction of effective gateways among the various networks involved."*[46]

The evolution of additional services and enhancements would be pivotal to the way any national network was developed.

> *"Networks such as CSnet and Bitnet offer information services that respond to electronic mail and often help users find the electronic mail addresses of colleagues, or strangers with similar interests. They also serve to keep users abreast of developments associated with the network. Journals encourage the electronic submission of articles. Software is distributed from on-line library services. The list of services and use of research networks will continue to grow in the immediate future." Every effort should be made to develop a number of network information services for the local research community, including the ability to redistribute international information in a cost effective manner. "Creation of a Network Information Centre should be seriously considered to manage these services as well as the country's international gateways."*[47]

Unlike many other countries, New Zealand did not have any national body with overall responsibility for research and development.[48] In the absence of a centralised body or any funding, an ad hoc group had taken responsibility for establishing a research network in New Zealand. There was no operating budget, and it was unable to make and implement decisions. It could only recommend action based on what should be done and hope for follow-through. Consequently various universities

set up administrative procedures to charge other universities for the communications costs of gateways and other services. Hine said this added unnecessary cost to the development of the Internet locally and discouraged its use by the research community.

One option was for the DSIR and the University Grants Committee to jointly fund a group to administer and develop the network, but this would result in the university (Victoria) and DSIR supporting the remainder of the community. Hine concluded that "every effort should be made to find some basis for continual funding of New Zealand's research networks and the Network Information Centre."

New Zealand needed to act quickly to establish addressing domains and standardised naming conventions to ensure electronic mail got to and from the desired destination.[49] The ISO had assigned a standard two-letter abbreviation for each country and everyone but the US had adopted these as the top-level domains. The New Zealand top-level domain was dot. nz and responsibility for managing was assumed by the New Zealand vice chancellor's Standing Committee on Computing. At a February 1987 meeting it was decided New Zealand would follow international precedents and have three second-level domains. The .ac domain or academic domain would cover universities, polytechnics, and schools. The .govt domain would cover all government departments and a third domain (.co.nz) would cover all commercial organisations. At the time no organisation had assumed responsibility for the commercial sector and a commercial domain was not in existence.

Hine urged the private sector to become involved in the development of this network to help foster collaboration in research activities. He said establishing support for domain naming and addressing should receive top priority as it would "facilitate international connections and ease of use for the general research community." He reiterated his concern at the lack of consistent funding for the development of a national research network. "While I have no doubt that the payoffs are so great that the network will evolve, I fear the evolution will be frustratingly slow because of a lack of commitment of funds. This remains the biggest obstacle to the development of a comprehensive research network."[50]

EARLY WARNINGS IGNORED

The lack of a central body to co-ordinate research and development a national network had been highlighted in the 1986 report of a ministerial working party on science and technology, 'Key to Prosperity: Science and Technology,' also known as the Beattie Report. It had concluded that New Zealand should double its overall R&D spending in the public and private sector by the 1993–1994 year.

The report stated that if New Zealand was to improve its 'knowledge, innovation, and productivity' and keep pace with other nations it needed to shift from labour-based to knowledge-based industries with an adequately trained and informed workforce, and ensure 'managers and boardrooms' were more aware of the potential of R&D to facilitate innovation.

"We are convinced that New Zealand's overall present performance in all three aspects is less than adequate to achieve a significant rate of real growth. Market forces cannot be expected, unaided, to influence these important factors sufficiently to allow New Zealand to hold its own against competition, let alone do better," the report said. While accepting the principal of user pays and that "the beneficiaries of particular research should be identified wherever possible and expected to pay," the report noted that the principles of the market philosophy, when applied to science, can fail. "For these reasons, a significant part of a country's wider research and development has to be recognised by the government as a public good and be supported by public funds."

The working party recommended the establishment of a minister of science and technology,

a cabinet committee on science and technology, and a science and technology advisory board to respectively enhance the profile of science and technology; develop science policy; and advise the government on R&D issues. At the science management level, the establishment of a Science and Technology Council was recommended, to allocate and fund basic and applied research through existing government departments, universities, and research associations.

The Beattie Report was ignored by the government, which promptly established another committee to review science and technology.

> *"The resulting report 'Science and Technology Review: A New Deal' (Arbuckle et al. 1988) signalled a radical shift in science policy and management. Many reasons were advanced to rationalise these changes including: the need to improve allocative efficiency; shifting management responsibility from inputs (i.e. expenditure) to outputs (specified outputs and outcomes); and, somewhat ironically, overcoming the confusion that had arisen, particularly among the science community, regarding the user pays policy. More profound, in terms of their subsequent effect on science, were the recommendations to adopt a policy to, '… give government R&D institutions access to a full range of commercial powers,' and, '… adopt contestability as the governing principle for the allocation of funds for research and development activity.'"*[51]

This would overcome the management restrictions implicit in the Public Finance Act, which measured expenditure rather than output or outcomes, and enable government research institutions to engage in contractual arrangements only possible in the commercial sector. This, it was argued, would encourage private investment in science and technology.

> *"The principle of establishing one large contestable pool of government funds, to replace the former system of government department allocations, was simply the application of market theory to the science sector–the market, not the government, would provide the best signal as to how to allocate R&D expenditure. To support this recommendation, the Arbuckle Report strenuously countered the market failure arguments offered in the Beattie Report and argued the case that the government should not, unless under very specific and narrow conditions, intervene in the market place...The position taken in the Arbuckle Report was in essence: if there was someone who benefits from the research then they, not the government, should pay for it, leaving the crown to presumably fund research for which no-one benefits! At its extreme, the Arbuckle Report argued the case for the government not funding R&D – quite a different policy position from that reached in the earlier Beattie Report."* [52]

It was clear that the visionary approach taken by the pioneers within the computer science departments of the various universities, the evidence of numerous reports into the inevitable growth of the use of technology, the need for universities to connect to each other, and the importance of a standardised and co-ordinated approach to wide area and international networking was falling on deaf ears. Persistence and funding for the best ideas were imperative in order to avoid atrophy or worse, uninformed decision making.

4

Nuclear free reforms

Nothing is what it seems

The sheer speed of transactions available through telematics, the coupling of computers with telecommunications, notes political studies lecturer Joe Atkinson, has transformed business worldwide, virtually obliterating most local markets and making the international financial markets much more volatile. In all facets of communications, computers will be big. Their components on the other hand will become even smaller… With hardware getting cheaper it won't be long before there's a personal computer in most homes. Soon, said Stella Belliss of the DSIR's information technology division, we'll be able to tap into all sorts of computer networks and database systems. Which means we'll be able not only to work and play Space Invaders but also do the banking and order the groceries on the same machine.
Metro Magazine, 2020 Vision, August 1990 by Peter Allison.

From 1984, the Labour Government under David Lange began to introduce "the most sweeping reforms the New Zealand economy had seen in 50 years,"[1] effectively experimenting so much with political and business structures that internationally the country began to be viewed as a social laboratory.

The rapid reforms and their wide-ranging impacts included redefining the role of government and requiring the public sector to become more effective, transparent, and accountable. With these measures, it went further, faster than any other nation in the free world.[2]

In a few short years the culture went from one of regular government intervention, assistance, and subsidies to ensure level playing fields, to letting the market decide. The rationale was that the economy badly needed a shot in the arm. The adrenaline the social engineers prescribed was tough love, a kind of economic Darwinism where the realities of the marketplace would decide who succeeded and who failed. From 1986 that meant wide-ranging privatisation of state assets and a new aggressive, hands-off environment where railways, health, electricity, broadcasting, telecommunications, and even universities and research and development had to be profitable in the free market.

The SOEs Bill was introduced to parliament on 30 September 1986 and passed into law in a little over two months. It established nine new SOEs: Airways, Coal, Electricity, Forestry and Land corporations, Government Property Services, NZ Post and Telecom.

> *"New Zealand became a laboratory for an experiment: the transformation of the world's first welfare state into the world's first post-welfare state. Around the world gurus of market-driven economic theory watched in envy as a tiny nation in the South Pacific did an about-turn and marched in a different direction," M. Russell,* Revolution: New Zealand from fortress to free market, *1996.*

The main thrust of the reforms was economic restructuring through deregulation, corporatisation, and privatisation. The currency was floated and banks deregulated. All farming subsidies were removed. In the public sector, the SOEs Act identified the trading activities of government entities and separated them out, as being the role of businesses. The 'rump' government departments were then reorganised to become more efficient by means of the State Sector Act, which gave public servants more power to manage but demanded more accountability. SOEs were designed to be market driven and corporatised to introduce business disciplines and financial accountability. Corporatisation was the step before privatisation. The prevailing view was that public services by definition could never be commercially competitive; therefore governments should adopt a minimalist approach. The first consideration under the new business regime for SOEs was to prune staff through massive redundancies.[3]

The NZPO was split into state trading companies including NZ Post, Postbank and Telecom Corporation. On 31 March 1987, the newly created Telecom became an SOE. The government-owned Telecom Corporation then purchased the telecommunications-related assets of the old Post Office for $3.2 billion and underwent a major shift, from a public service organisation managing an essential public infrastructure to a commercially focused business.

There were still 38,000 party line customers on the Telecom network but work began in earnest to improve the network and the services offered, as the telecommunications market was progressively deregulated. Telecom launched its 025 mobile voice and CDPD analogue mobile data network, and by the end of 1987 it had 2000 customers. It cost $2.84 for a three-minute fixed line toll call between Auckland and Wellington and $4.20 for a three-minute off-peak call to Australia.

While the new Telecom was busy with internal restructuring and gearing up to impress potential investors, Murray Milner, who had been with the government department from 1971, was appointed as head of the Advanced Technology Group. Milner had joined the Post Office straight from school and done a bachelor's degree and PhD in electrical engineering at Canterbury University. He was recognised early on as an important asset. When the news came through that he'd been appointed to head an elite group of technologists to help Telecom prepare for the technical transitions ahead, he was in Silicon Valley, in California. After spending a year at Carnegie Melon University he was part-way through a Harkness Fellowship at Stanford, completing postdoctoral studies in electrical engineering and public policy economics, based around his involvement in domestic satellite communications in New Zealand.[4]

From 1987 Milner would log on to the fledgling Internet at 2.4kbit/sec from Silicon Valley using his dual floppy disk laptop to keep in touch with the rest of the Telecom Advanced Technology Group. His mail would come into Waikato University, then on to Victoria University. His team would dial in for one hour a day to upload any messages or files. "We hired a lot of people by placing postings on technical newsgroups and while we were very vocal about where this technology might lead, within Telecom there were always issues raised about the underlying technology and the usability. There was little interest beyond the academic community," Milner admits.

THE SHRINKING COMPUTER

"I think there is a world market for maybe five computers." Thomas Watson, chairman of IBM, 1943.

"There is no reason anyone would want a computer in their home." Ken Olsen, president,chairman and founder of DEC, 1977.

"Bringing the first computer into the home can be compared to having a first baby. It is eagerly anticipated but nobody realises just how time consuming or complicated it can be until it arrives. It can be fun, challenging, relaxing and at times most frustrating. It ends up growing, consuming money rather than food, it soon becomes part of the family. Like any new addition it can put a strain on family relationships, but once you have one you will not easily give it up, save on those days when it burps and messes up all you were trying to achieve," Selwyn Arrow, NZ Computer Society 25th Anniversary book Looking Back to Tomorrow, *1985*[5]

"Computers are essentially different from people in that they only process data and have no understanding of what they are doing. The computer is a tool that is designed to do a particular job in a particular way. You cannot communicate with it; all you can do is provide it with its raw material – data," Colin Beardon, Computer Culture: the information revolution in New Zealand, *1985*[6]

When *Time* magazine replaced its 'person of the year' award with an award to the PC as machine of the year in 1983[7], it was clear personal computing was going mainstream. The 1980s had become the decade of the microcomputer, as desktop machines began taking their place as a serious tool in the business community and attracting wide acceptance beyond hobbyists and educators.

After reading about US microcomputer clubs, Brian Conquer, an enthusiastic computer hobbyist, sent letters to interested individuals and electronics firms in Auckland in early 1977 calling for a meeting. In May, 39 people turned up to form the New Zealand Microcomputer Club. It was thought computer hobbyists and professionals from other parts of the country might be interested but the response wasn't as enthusiastic, so the idea of a national association was dropped. Instead it was decided to publish *NZ Micro*, a club magazine, and form a loose association of members around the country.

Members were technically inclined hobbyists with a sprinkling of mainframe computer users. All were keen to make and use their own microcomputers. The emphasis of the club continued to shift along with changes to the computer itself, including a swing away from hardware to software.[8]

At first, many schools held back because they were unsure of the type of equipment they needed and how to use the new technology for education. By 1980 there were fewer than 100 computers in secondary schools, but by the middle of the decade, the number was approaching 3000 and more than 95 percent of secondary schools had at least one microcomputer.

New Zealand's first and only indigenous home computer systems[9] were created in 1981. The Poly, named after Wellington Polytech where it was developed, was targeted at school use with a colour screen and an obscure proprietary networking system. The Amber Pegasus supported multiple computer languages and a network version connected to

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a server. Both attempted to meet the requirements of the government's computers in schools initiative, which never produced orders large enough to become a commercial reality.

Maurice Williamson, who became National MP for Pakuranga in 1987 and later New Zealand's first IT and communications minister, had a master's degree in computer science from Auckland University.[10] In the late 1970s he was working in the corporate planning department at Air New Zealand, in fleet planning, purchasing, and acquisition of routes. "We needed to do a lot of number-crunching about long-term forecasts using GDP models to work out where the traffic was going to grow and so on. This required me use computers and write code in PL1 and Fortran and assembler language on the mainframe."

In 1982 IBM supplied Air New Zealand with the first of the twin floppy PCs to arrive in the country. "I remember sitting down and playing with it one day and these big bloody 8-inch floppies were, well, really floppy – not hard like the 1.4-inch disks that came along later. They were like cardboard and wobbled all over the place. Rolf Harris could have played a song on one of them. Anyway it was all DOS 1.0; you could do Lotus 1-2-3 spreadsheets floppy, and MultiMate word processing and that was it. It had a green screen and the text was so pixellated and the dots so big it was hard to tell if it was a one or a seven. Then you had these twin big drives. The A-drive used to take the Lotus 1-2-3 disk and on the B drive you could save the file you were writing to."

From the early 1980s the first mainstream personal or microcomputers were introduced. A lack of suitable application software, and the fact the earliest machines didn't come from big companies with an established base but relatively small traders with agency arrangements meant uptake by businesses was slow. Without the after-sales support and the necessary knowledge to advise and train customers, frustration and failure were common. Computer journalist Stephen Bell explained there were other obstacles holding back the market: "A further handicap was the 40 percent sales tax imposed on 'office machinery' by the Labour Government in 1975, largely for fear of job erosion. In retrospect, this was an inexplicable decision, widely regarded as having prevented small businesses in New Zealand from taking advantage of computing power for several vital years… The big impetus for business micro development came when the tried and trusted names began moving into this part of the world. IBM's personal computer met an enormous pent-up demand when it came to these shores in early 1983, 18 months after its release in the US… It rapidly established as leading position in the market … and begot its enthusiastic imitators. The IBM led to a flood of software from local and overseas developers to work with the new machine… What was more astonishing was the growth in local agencies for micros. Almost every significant machine in the world was represented on the small New Zealand market within a few years."[11]

Many of the early resellers, while well intentioned, failed simply because they didn't have the time, manpower, or skills to support these complex early machines. The first computer exhibition was held in a school hall in 1980 and about 800 people showed up. Attendance doubled each year for the next three years. By 1983 the higher profile exhibition had moved to the Auckland Showgrounds and the following year the Micro Show had an attendance of 8500 and featured 58 commercial stands. By

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this stage the club had its own business computer and database.

By 1984 there were 15 user groups within the Microcomputer Club, each specialising in different kinds of applications or computers. The combined Microcomputer Users Group had been formed in January 1982 to communicate with other groups around the country. One of its projects was the design and manufacture of low-cost acoustic modems so computer users could connect their machines over the telephone lines. This worked for the club until January 1984, when lower-cost commercial modems became available and the club, which now had about 600 members, established its own computer bulletin board system.

The BBS was run initially by Attache Systems with software acquired from Sydney that enabled users to send messages and files over phone lines. The NZMC started its own BBS in 1985 with improved downloading and uploading of programs. The number of computer clubs around the country grew and lists of contacts for each club were regularly published in New Zealand's first computer magazine, *Bits & Bytes*.[12]

By 1984 one estimate put the value of microcomputer sales at $65 million or the equivalent of about 5000 machines complete with software and accessories. Another report suggested about 6000 microcomputers a year were likely to be introduced into New Zealand from 1983–1988. A Department of Education survey found 1282 microcomputers had been purchased by schools in the 15 months from October 1983.[13]

In his 1985 book *Computer Culture*, Colin Beardon predicted that each house would have "a computer television set," which would become as common as the telephone. It would be possible to use these as word processors to write letters and reports and send these automatically over the telephone system. "During the remainder of the 1980s we can expect computers to be fully absorbed into our society, whether we like it or not. They have already been adopted by our economy and are being exploited by large numbers of organisations who can now do more things, more efficiently with few people. Next they will be absorbed into our culture… Information will no longer be the content of private communications between people; it will be turned into a public commodity. Information will be bought and sold; information machines will be sold as the latest consumer goods; there will be 'information rich; and 'information poor' people."[14]

From the early days of the mainframe computer some form of messaging from the central machine out to connected terminals was possible, but it took years to break the proprietary hold so networks could connect to networks. Once New Zealand universities figured out how to link with international servers, to access academic and technical documents and download free code, there was an unstoppable momentum.

While the backroom boys at Telecom were well aware of the technology and continued to use it, nobody quite knew for sure where TCP/IP would end up. It was nearly a decade before Telecom took the Internet seriously as a commercial opportunity, although it kept a close eye on the universities as they experimented with offshore connections. There was a growing concern about all this anarchy that seemed to bypass the established telephone networks.

CAN ANYONE PLUG US IN?

John Houlker from Waikato University and Professor John Hine from Victoria University's Computer Science Department received an important invitation to attend an academic workshop in Princeton in late 1987. The invitation from Larry LandWeber,[15] who ran the International Liaison programme for CSnet, was the opening for a landmark moment in the history of the Internet in New Zealand. Waikato had already connected to the Internet backbone via CSnet and was technically operating the dot.nz country code. But having been convinced by Telecom the way forward was X.25, it was still trying to cobble together an efficient solution to share that store-and-forward access with other universities. At the workshop Houlker was working the room, looking for a way to get software that would enable TCP/IP to run more efficiently over X.25, or perhaps convince someone to subsidise a circuit to the United States so that New Zealand could connect directly to the Internet backbone.

He wasn't having much luck. Then at a workshop dinner he was approached by Tony Villasenor,[16] head of National Aeronautics and Space Administration's (NASA) scientific Internet, and Jim Hart, a high-performance computing specialist from NASA's Ames Research Centre. They had noticed Houlker's persistent campaigning and thought they might have common interests. "I thought we'd struck gold. They had been working on a programmer at NASA to get the Internet across to the Asia-Pacific region to connect a variety of science projects they were involved in. They typically used leased circuits on a project by project basis but finding someone in the other country to help them sort out the options, and the cost of getting all that equipment in and running was time consuming and expensive," said Houlker.

Villasenor and Hart were heavily involved in ARPANET and linked directly into the NSF Internet backbone, and were looking at ways to avoid the cost and complication of employing people in each country. They had several projects in New Zealand, including the Kiuper Airborne Observatory in Christchurch, and a weather station at Lauder in Central Otago, as part of an Earth Resources 2 (ER2) project which involved World War II U2 spy planes, gathering ozone readings over Antarctica. The Kuiper base tracked a converted US Starlifter aircraft with an infrared telescope in the fuselage, which circled the Tasman at high altitude, plotting certain stars to provide critical data. The U2 aircraft were based at Christchurch Airport along with their original pilots, but required highly accurate and classified meteorological data from the United Kingdom, relayed through the New Zealand NASA link. A key location for all NASA's activity in New Zealand was the NSF Antarctica Gateway in Christchurch.

Villasenor and Hart were not only helping out the NSF with its projects in New Zealand but were hoping to use this association with New Zealand to convince the science and academic community in Japan to join the Internet. "In fact NASA was very keen to convince Japan to go the TCP/IP way rather than OSI which they were considering at the time. They thought that if New Zealand, Australia and other Asia Pacific connected to NASA's Pacific Communications programme (PACCOM) using TCP/IP this might encourage Japan to head in the same direction."

NASA agreed to pay for half of the circuit to New Zealand as part of PACCOM. Managing the remote end would be Dr Torben Nielsen,[17] director of the Computer Science Department at the University of Hawaii. This was a marriage made in heaven because the University of Hawaii had the job of outreaching to the Pacific and endeavouring to increase the speed of its link to the NSF backbone. Nielson was championing that; also, because the ANZCAN undersea cable went through Hawaii, it made sense. It looked like a done deal, until representatives of the Australian research and academic networks weighed in with their own proposition. They suggested New Zealand was still disorganised and Australia could deliver everything NASA wanted. If the link terminated in Australia they would sort out New Zealand from their end. Seeing the groundbreaking deal fading

before his eyes, Houlker countered that the cost of a circuit between Australia and New Zealand was about the same as from New Zealand to Hawaii. "It may look a small gap between the two countries on the map but getting a circuit across the Tasman is not a trivial exercise. We were also able to demonstrate that the DSIR, the universities and the technical arm of Ministry of Agriculture and Fisheries (MAFtech) did in fact have a common view."

Having to connect through Australia would not have gone down well. "Getting funding assistance from the US Government through NASA was very tantalising, and being forced to go through Australia and paying the full rate did not appeal," Houlker said. NASA needed someone to take all the risk and the New Zealand end it took some months to sort out the logistics. Mark Topping, computer centre director at the University of Waikato, called a meeting of directors from other universities where Houlker made a presentation, explaining his coup in securing a 9.6kbit/sec link to the Internet backbone.

It was going to cost $120,000 a year, or, with the NASA subsidy, $10,000 for each of the six main universities. Topping convinced Waikato's vice chancellor to be guarantor and collect the money for the link into Waikato. In the end the universities, the DSIR, and MAFtec agreed to help cover the cost of the circuit to Hawaii. "It doesn't seem much now but at the time that was a huge hurdle and the cost was a little more than we had been paying in total for international email in the different forms we got it," said Houlker.

The initial management responsibility for the new international link was based around the university network group representing Spearnet (South Pacific Education and Research Network), which had been formed to manage access to Coloured Book services like Janet in the United Kingdom. Rather than the previous arrangement with CSnet, which ran the DNS on Waikato's behalf, Waikato University would now run the DNS itself. Houlker was registered as the person responsible for administering the zone, and was entered in the WHOIS database as the contact for the country code, representing the University of Waikato. "While personal connections and trust were certainly part of the FOJ (Friends of Jon [Postel]) network of confidence, I would have expected a successor at the university to have taken my place if I had vacated the role."

IT'S ALIVE… WELL, ALMOST

Milo Madin, head networking engineer at NASA, had a penchant for using military terms for Internet use, and is credited with pioneering the use of the term 'demilitarised zone' for Internet interconnection. He had also used the term Forward Edge of the Battle Area (FEBA) in 1988 when naming the first Internet exchanges in the world; FEBA East at the University of Maryland, and FEBA West at NASA's Ames Research Centre. A couple of years later, senior management at the agencies became aware of what the exchanges were doing, and while impressed at what was being achieved, were alarmed at the names. This was immediately resolved by re-designating them as Federal Internet Exchanges or FIX East and FIX West. According to Houlker exchanges were created because of "the complex and random interconnection required between the various federal networks and the NSFnet backbone and the ongoing tensions and differences of opinions between the agencies and the IT people managing the networks." He based the original exchange at the University of Waikato on the FIX model.

In April 1989, a full 18 months after the Princeton meeting, the analogue undersea link to Waikato went live. At the Waikato end was a software-based gateway linking the various types of email, and a translation gateway built from an innovative mix of the CSnet software and code from the United Kingdom. Everything seemed to be working fine but when they switched on the 9.6kbit/sec analogue modem and the Proteon router provided by NASA, not a lot happened. The router

had been misconfigured so Houlker soon had the top off and was poking around. Madin had sent the router without a manual because he was determined Houlker shouldn't open the box or touch anything. Houlker eventually got Madin on the phone reading out instructions from the manual to get a clearer picture on how to move a chip inside the Proteon. "I remember it was a Sunday and I was a bit worried because there was no support in New Zealand, and if I broke it we'd have to send it back to the US for repair and still be paying all this money for an unused circuit."

He carefully lifted the chip out of the router and on attempting to replace it, bent a pin. Thinking he'd blown the job, he tried one last option, gently straightening the pin, all the time fearing the worst, and thinking about the six-week delay and the huge bill if it broke. Fortunately the IC chip slotted securely into its new location. The router was reset and immediately there was action on the line. At first it was pings back and forward to determine the remote location and the speed of the network, and packet tracing to see what was out there. The next phase used Telnet[19] to connect to the computer in Hawaii and see what addresses came up. One of the first messages that arrived on his screen was NORAD, which had Houlker presuming he had hit the North American Aerospace Defence Command headquarters. He'd only been on the US backbone a couple of hours and was now concerned he might be in trouble for trying to get into some US military site. He soon discovered this was the handiwork of NASA engineer Milo Madin, who had called the humble old name server computer at the University of Hawaii NORAD. Pretty soon, email, the application everyone was eagerly awaiting, was up and running.

Part of the deal with NASA was that Waikato, and Houlker in particular, would be required to be the troubleshooter if things went wrong at the NSF operations in Christchurch, particularly if the connection wasn't up to par. He often found himself on call, sorting out problems using remote technology, or flying to Christchurch or meet with the local technical people who didn't have much networking experience. If something did go wrong Houlker was required to report back to the United States in detail. All costs involved were borne by Waikato University. "One of the fibre cables across the Atlantic got broken and the connection was relayed onto satellite but the performance wasn't good enough so I had to sort that out. Then they had kit that had been sent out from NSF in Washington which was designed to do back-ups of their Sun workstations over a local area network. They were wondering why the network was performing dreadfully and I eventually tracked it down to the fact that the workstations were trying to do their daily back-ups to Washington DC," said Houlker.

DELAYS CONTINUE

Access to this important international communications resource was soon fuelling breakthrough collaborations in the United States and the United Kingdom, and the technical pioneers at New Zealand universities were again looking at ways to connect their network resources and create a national infrastructure. While Waikato was more organised in the way it dealt with the international link, the universities were struggling to get their slice of raw Internet. The absence of any government or other leadership from the 1970s onwards meant first attempts were ad hoc.

Frank March, who had moved to Victoria University as director of Computer Services after a decade at the DSIR and a spell consulting within government, said the lack of leadership was a major obstacle. "Nobody in authority and nobody at the general manager or even the normal managerial level had any idea what this technology was going to be able to achieve. It was driven outside the normal budget processes by individual enthusiasm, based very much on the fact that there were close linkages between computer science departments who knew about this technology, were working on it and reading the technical papers."

This resulted in decisions being made about domain names and other technical and political issues that in hindsight might have been made differently. "They were trying to make important but arbitrary decisions with limited information because something was going to happen tomorrow that required a decision today. And those critical decisions were made by a handful of people."

Auckland University had been in discussions with a Canadian university, which agreed to hook it up to Bitnet. After getting the connection to work using Bitnet software, emulating Bluebook Ethernet over Pacnet and running RSCV, it was ready to go live. Just as the university was in the final stages of sorting out the political issues, news got out that Waikato University had achieved what everyone thought was impossible: a direct connection to the US Internet backbone.[20] Auckland dropped everything in the hope of seeing a university-wide network emerge but true to form, nothing was easy or fast. Frustration was mounting as attempts were made to interconnect a confusion of networks and protocols to comply with the more open sourced TCP/IP of the wider Internet.

The first IP link from Waikato was a serial line interface protocol (SLIP) link between Victoria and Waikato running over the DSIR's internal serial network, with an 8086-based PC-router at each end. It ran at 9.6kbit/sec, although the DSIR constrained it to only 4.8kbit/sec.[21] The theory was that there was sufficient spare capacity on the DSIR 4.8kbit/sec network to accommodate DSIR internal traffic and the university use. This proved not to be the case.[22] The link between Victoria and Massey University finally went in six months after the international link was established at Waikato, after the Wellington end got fed up waiting for the computer centres to get something working.[23]

While they continued to pay their share, it was still some time before Canterbury, Massey, Lincoln, and Otago got their promised link to the US backbone via Waikato. Efforts to try and tunnel TCP/IP traffic through the DSIR network had failed. "Initially we had a gateway to the Coloured Book software but this wasn't as powerful as a direct connection to the entire New Zealand network. I was working on modifying TCP/IP software from Carnegie Mellon so we could use X.25 the same way we had on the CSnet. I had connected a trial network across the DSIR network between Waikato and Victoria but had huge trouble getting it to work," said Houlker.

He persisted with the DSIR engineers, asking if there was anything wrong with their software. They reassured him it was rock solid. "I kept going back to what I was doing but couldn't find much wrong. In the end I thought I'd try DECnet over the DSIR network and that didn't work either but it did give me a pile of diagnostics showing faults with the DSIR's X.25 system. By then the other universities were getting really annoyed with me over the time it was taking to get the network sorted. Then DSIR conceded that perhaps their X.25 didn't work properly after all."

Frank March admits there were enormous battles going on, that even today have left scars across the research and academic community. "It was so expensive to run lines up and down the country under a strong Telecom monopoly, so the idea was to use the DSIR network to connect the universities together by tunnelling TCP/IP through the DSIR NodeCode protocols. I don't think John Houlker quite understood how the DSIR network was supposed to handle tunnelling, but the real problem was the DSIR network was appallingly slow and there was bad blood generated on both sides because of this."

While some were keen or co-operative, others remained deeply suspicious at the universities plans. This was partly cultural and partly because the DSIR network failed to bridge the gap. "On paper it looked all right but it never did work properly. I recall years later talking to someone from DSIR who was railing against Waikato University and everything it stood for. This guy was still bitterly angry at what had happened. And people like John Houlker still shake their heads in disappointment. I suspect there was credit in what both parties were trying to do but it was just too hard," said March.

All the while the pressure was on for academics to be able to email their colleagues around the world and to access the news. Bulletin boards had started to crop up from the late 1980s and were creating a lot of interest, making newsgroup content available to their users. Anything that could be cobbled together to make this work was acceptable at the time, and the DSIR and universities were a big part of that. Eventually the networks came together but long-term decisions still needed to be made about the protocols that would be adopted for the research and academic network and for the future. "That's where the real difficulties came in, with people saying 'my way is better than yours,'" recalled March.

The new, more commercial approach of state-owned Telecom resulted in a change not only in technology direction but in its attitude towards its clients, including the nation's research and development facilities and universities. Instead of working with them for the kind of public-good goals expected of government departments, Telecom began playing a game of divide and conquer. It was clearly now placing profit ahead of the longer-term goal of a robust, nationwide academic and research network.

While the X.25 tunnelling problem was being resolved it suddenly became clear that a lot of time and effort had been wasted because Telecom did a complete about-turn in its charging. Its promises to the universities that X.25 would be delivered at a much lower cost than leased lines didn't pan out. Houlker said Telecom's decisions on how it priced its different services was crucial. "They pushed us in one direction and with deregulation there was a 180-degree change to align with what was going on in the United States. Public X.25 charges stayed the same and they halved the cost of leased lines, which continued to drop. In fact the whole equation of trying to do stuff on X.25 dropped away so we planned on building our own leased line network."

Within six months of the Waikato gateway going live, pure economics forced Waikato to review its connection with Hawaii. The network had become congested but increasing the bandwidth required additional multiplexed circuits and Telecom's price for this was onerous. There was no advantage in remaining connected through the ANZCAN cable to Hawaii. Despite the inherent delays, the cost of a satellite circuit direct to the NASA's Ames Research Centre in Mountain View, California, was slightly more affordable and gave better performance.

NASA's Hawaii-based science Internet project was an extremely well-connected part of the US Internet with a direct link into NSFnet so any improvement in connection in New Zealand was going to be beneficial. Milo Madin, who managed the Hawaii gateway, sent an upgraded 14.4kbit/sec satellite modem, valued at $NZ7000. That transition didn't happen as smoothly as Houlker had hoped either. Telecom insisted it must be 'type approved' and power tested at a cost of $3000. He had a few words to contacts at DSIR, which did type approving for Telecom, and the bill came back at $300. In October 1989, not long after the new modem went live, the San Francisco earthquake hit. Within four hours, when the batteries at the San Francisco telephone exchange ran out, the line went dead.[25]

WELCOME TO NETWORK LIMBO

Irishman Andy Linton was a late starter in computer science, having worked as an outdoor pursuits instructor and maths teacher in schools and the British Royal Navy. At the age of 30 he returned to the University of Newcastle to gain his master's degree. In 1981, when computer science was still in its early days, Linton caught the bug and stayed on as a research associate on a project called Highly Reliable Distributed Systems, writing code to network Unix systems. His project was geared around building systems for air traffic control and train signalling systems. "We had multiple machines talking to each other and running complex algorithms; this was triple modular redundancy stuff which went into production systems eventually."

His team knew of the TCP communications protocol but preferred to write their own drivers and build systems from scratch using Unix seventh edition. In 1982 he got hold of the first copies of the Berkley 4.2 BSD Unix code, which included TCP/IP. However the UK Government and various standards bodies discouraged its use. "They even had a joint network team, affectionately known as the protocol police; universities and other government departments looking to network computers were told to base all their development on 'the purer' seven layer OSI model," said Linton. He and his associates were in a bizarre situation where all the interesting research they were doing was based on TCP/IP but this had to remain unofficial or they wouldn't have been eligible for grant money. Once the unofficial TCP/IP stack was up and running across the research departments, Linton became the postmaster and applied for all the IP addresses for the university.

As part of his work in the computer lab at the University of Newcastle, Linton ended up supervising some of the masters students. Among them was a New Zealander, Cindy Treloar, studying computing software and systems design. She was heading back to New Zealand when Linton quipped, "If you hear of any interesting jobs let me know." He'd been looking to advance his computer science interests and been offered a position with the University of Queensland the year before. Then his father passed away and he decided not to go. Cindy knew someone at VUW, who asked Linton to mail his CV. That resulted in a 'bizarre phone call,' more or less asking, "When can you start?" "I'm saying, 'Well, you know if I resign now I could be there by August.' And my wife Sheila's sitting on the other side of the living room with a surprised look on her face, saying 'What are you talking about?'"

There was a strong link between Newcastle and Victoria University, which Linton didn't know about at that stage. American John Hine, Victoria's head of Computer Science, had worked at Newcastle University before arriving in New Zealand. So, in 1989, with the university agreeing to pay the moving costs, Linton committed himself for three years. One of the benefits offered to him was full Internet connectivity. On arriving in Wellington, Linton, having enjoyed liberal email communication with colleagues across the United Kingdom and United States, learned full connectivity to the Internet was still being worked on. "They had explored a number of UK-style conventions and knew TCP/IP was the way forward but there was no plan on how to get there," he said. Computer Science Department technician Mark Davies gave him the grand tour and Linton asked about the 'full Internet access' that had been promised. The response came back: "Well, you know… soon."

Once access was cobbled together the Victoria Computer Science team couldn't wait to download anything and everything. "We connected to the FTP server on US-based UUNET[26] and began downloading files, including every bit of code we could get our hands on that would be useful to our various projects." Victoria's UUCP connections also enabled it to dial into the University of Melbourne to access the machine of Robert Elz,[27] an Australian Internet pioneer, who provided feeds to all sorts of interesting groups. "We burnt the link hot for a while."

Grand ideas had been floated about how all the universities should be connected but the mix of different computers, protocols, and networking approaches, and the cultural clashes between DSIR and the universities, were keeping everyone at arms length. If you wanted to get access to the main universities, it was a two-stage process. To pull files into the country or from another university you had to bring them into Waikato University, which by then had a direct connection to the NSFnet Internet backbone. Then you had to use something different to copy files across and bring them down to Victoria using DECnet over X.25.

Distracted by their newfound connectivity and the ability to download as much open source code as possible, the enthusiastic pioneers at Victoria University's Computer Science Department were about to face fiscal reality. "It seemed we had, ah, run up a large phone bill

and basically got the message that we'd better knock our activities on the head. We were about $10,000 in the hole just through the network traffic," recalled Linton. While Computer Sciences Department head John Hine was 'very supportive' and keen to see international connectivity, there was still the matter of who was going to pay the bill. No one in the accounting department was ready to even consider it could be written off as justifiable research costs. "The whole idea that you'd spend a lot of money on communications was relatively hard for people to grasp," said Linton.

One way to avoid the high cost of connecting through UUCP in the United States was to ramp up efforts for Victoria to get an IP connection to Waikato University through the DSIR and charge for services to third parties. "Once you got to Waikato you could start piggybacking on NSFnet. That was a strong driver." At this stage, even though the universities were all contributing to the cost of the new international link, the technical reality was still being worked through. There had been talk about running TCP/IP over DECnet over X.25 but it all seemed very convoluted and complicated. So between Linton, technician Mark Davies, and Jonathan Stone,[28] a solution was cobbled together to create direct channel circuits through the DSIR network using PCroute,[29] which acted as a cheap TCP/IP router. "There were some interesting challenges because the DSIR network was designed for terminal emulation and there needed to be some changes. Every time CTRL+P appeared in the data stream it took you out to a menu, and the whole system would lock up," said Linton.

The trio then used their influence with various computer science departments to get a more direct link from Victoria University to Waikato, hopping from the DSIR network node at Victoria campus through to Gracefield Laboratories in Wellington where the DSIR had its IT support department. They had established the initial DSIR-based links to the international gateway at Waikato, using a modified form of SLIP over the DSIR circuits. Tony van der Peet[30] the network manager at DSIR, made the required changes to the DSIR's Ace[31] boxes to allow the permanent links to be established, initially at the glorious speed of 48kbit/sec. "I think that was a real catalyst for the other universities. Others may have a different view but I believe that was the wake-up call," said Linton.

Up until then the administration for handling the charging for the international gateway and attempting to co-ordinate a national research and science network had been in the hands of the old Spearnet committee. Now, with links cobbled together across the country and some form of network in place, a meeting was called between the seven university computer centre directors. Seats were reserved for Victoria, one each for the Computer Sciences Department and Computer Services. "I think that said something about us having established our credentials and that people wanted to listen to our ideas."

It was still mostly computer scientists engaged in research and development who were interested in the Internet, although those with other science backgrounds were beginning to take notice of the opportunities it offered. The main one was access to the Usenet newsgroups and the discussion was centred around the massive volumes of data being downloaded – how this could be managed with limited disk space, and how the costs could be shared?

Auckland, Lincoln, and Otago still hadn't connected to the Waikato gateway, but the meeting showed them what they were missing out on. "At this stage we were saying to Telecom that this [Internet] stuff was going to come really quickly and bite them in the arse if they didn't get up to speed, but they were of the opinion that it would never catch on." The universities were looking for a technology that could connect them all over a common set of protocols but Telecom insisted that because the Internet wasn't X.25 compliant, it wouldn't be reliable. "They were defending their proprietary networking approaches and saying no one would buy this Internet thing because of

the unreliability of TCP/IP packets. They just weren't on to it; their head wasn't in that space at all," recalled Linton. Rather than waiting for Telecom to catch up with the global trend, the universities were again forced into do-it-yourself mode.

Australia had connected to the PACCOM network a month after New Zealand, offering its users Internet access at flat-rate charges. Across the Tasman when the link got overloaded this was simply used as leverage to acquire further government funding for more bandwidth. Meanwhile Waikato had to come up with a strategy for equitable cost sharing of the international link with those now accessing the services on the university backbone. With no government funding to help carry the cost, the New Zealand administrative committee, after much discussion, agreed on a user pays approach.

John Houlker knew costs would only increase as demand grew, so early on a meter for volume billing was devised. He had read various white papers that claimed there was no way to bill by packet usage. "I couldn't see any reason why it wouldn't work so I drafted the specifications and my team produced the code fairly quickly." The development proved hugely beneficial to Waikato in managing growth and charging users, but to the rest of the world it became a source of controversy. "This wasn't the Internet way," was the feedback from those who had the benefit of strategic government planning and funding. Then, according to Houlker, when Chile used New Zealand as a model for its packet charging, academic papers began doing the rounds saying "the poison from New Zealand is spreading."

JOINING THE DOTS

Victoria University academics continued to email like-minded colleagues around the world through the gateways being maintained by the computer scientists, who were determined to drive this networking forward, regardless of how slowly their bureaucracies worked. While struggling to sort out decent access to the Waikato gateway, Victoria had its own internal networking dilemma. The Computer Science Department was forced to move into its new campus building away from its computers. Mike Newbery and John Hine submitted a report recommending Ethernet routing rather than bridging technology to link the new Computer Science building to the existing Computer Centre. "You could tell from the report and looking at what was happening in the industry that this was the way things were going to go. It was a pretty safe bet although we had to fight against some strong opposition," said former computer centre director, Frank March.

Victoria University eventually agreed to purchase routers from an unknown company called Cisco, rather than the better known Wellfleet or Proteon boxes, and to have them imported and supported by ECL (a division of the TV repair company Tisco),[32] from whom they were purchasing TRW access control or terminal servers. Victoria was the first in the country to buy Cisco equipment; it ordered five Cisco MGS routers, but Cisco was unable to deliver them on time and substituted the larger AGS models for three of them, enabling the creation of a much more robust and capable campus-wide network than planned.

John Houlker at the Waikato international gateway was also looking at this new company and the flexibility of its routers. "I spent quite a lot of time arguing that we should use Cisco routers instead of Proteon because they had other features we wanted, but I couldn't get the folks at NASA to agree. After a while I decided Cisco was technically just as good as the Proteon, and rather than argue we left the gateway as Proteon but used Cisco routers for the network we built for the universities. Cisco routers at the end of Telecom's point-to-point leased lines began rapidly appearing around the country as foundation stones for the first nationwide IP-based academic and research network."

GRASS-ROOTS NETWORKING

The Ministry of Agriculture and Fisheries (MAF) had established its own MAFnet X.25 network in 1985. It had been quite advanced in its approach and an early adopter of WAN, initially based on Prime computers. Then in the 1980s its Invermay campus purchased the first DEC VAX computer, which saw MAF going entirely with Digital. It used X.25 for international communications through a Telecom gateway and X.29 for remote access. Demand for linking with international research groups was growing but X.25 was expensive. As international collaboration became increasingly essential to keep up with international research, MAFnet found it was having to deal with X.25 OSI protocols for European connections, and as collaboration with the United States grew there was a need to enter the IP world. The difficulty of having to operate in both protocols resulted in a growing association with Waikato University and its international gateway, first initiated by its Ruakura Research Centre in Hamilton.

AgResearch chief information officer Phillip Lindsay.

AgResearch chief information officer Phillip Lindsay and his team found a way to tunnel IP over X.25 to ensure both European and US connections. "We were at the leading edge in a lot of areas but we had a relatively small research effort compared to many overseas nations, and always had to leverage what we could. There was a lot of animal research going on in the US that was of interest to us. Our collaborators were using new tools and we had to be on board to be part of that."

When AgResearch transitioned out of X.25 in the early 1990s and became more actively involved with Waikato, Lindsay and Houlker found themselves working long hours maintaining the beast that they had cobbled together. "John Houlker and I would both be at home late at night working on the network. I had an X.29 connection into our Cisco routers from my study and John would be on-line from his home resolving routing issues as well. When we first put the connections in we had quite a meshed network of the various parties, and everyone could see everyone else; if one party hadn't done their routing properly, you would get traffic flowing across each other's links. Otago University backhauled through our connection for ages before we knew what was happening. That was common in the early days and we had to pay for those links. Fortunately there was a good give and take approach, particularly among the universities and AgResearch."

IP INFILTRATES PARLIAMENT

Computer programmer Don Stokes had set up a bulletin board for DECUS in Wellington but when Government Print (GP) was turned into a SOE and readied for sale, the project's sponsor was moved on and the site was never used. Stokes had plugged the system into the DSIR and continued to experiment with accessing news and email over the Internet but the DSIR wasn't happy with him hogging its bandwidth.

Stokes had been experimenting with the email tools bundled with the Unix operating system and the X.25 messaging network to connect remote sites. Reliable email was still some way off and the addressing scheme was merely for identifying different machines. Alternative access through Victoria University gave Stokes an insight into how things were evolving beyond the proprietary

environments, and he and others in the IT department at GPO began to experiment with the next level of communications.

The Post Office had laid a 10Mbit/sec fibre cable[33] between GP's Mulgrave Street offices[34] and the Hansard office in the old Parliament building, which was used for early experiments with the IP communications protocol. GP operated a VAX 11/750 at Hansard, which was used to prepare and transfer the text for the Hansard publications, for printing and insertion into parliamentary full-text databases.

Stokes had established IP addresses on GP's internal VMS machines and parliament's Data General AOS/VS systems and begun sending emails and transferring files between the two. "I was able to get our email from the outside world into Parliament using UUCP before anybody realised it was possible." Internal Affairs, which looked after the parliamentary network, began to show interest as GP was already servicing the *Dictionary of New Zealand Affairs Biography*, which had an office in the corner of the historical branch.

An alternative mail system using DECnet had even greater reach within the parliamentary system. "You could actually route mail from outside, through our system and into Parliament, but I didn't consider it wise to suggest that the prime minister could be sent email by anyone with Internet access," said Stokes. There was some talk of connecting via IP to the Ministry of Education, and the Department of Internal Affairs which supported the parliamentary network and the National Archives. "It seemed to me GP was in a perfect position to drive development of an IPNetwork in the government sector." However there was a strong belief among government types that the OSI protocols would replace IP, and, GP's new owners were more interested in getting the core businesses right.

When Parliament Buildings was to be refurbished, Hansard moved to Bowen House, so GP requested Telecom move the fibre cable to the Beehive basement. "We could pick it up from there and get the connection repeated onto thick-wire Ethernet running through the tunnel under Bowen Street and up to Hansard." Telecom responded that it knew nothing of this fibre, it had never done dark fibre before; its own fibre was always single mode, and anyway it only ever sold 'services.' Stokes assured the company that GP had two ends running 10Mbit/sec. Telecom came back: "The fastest service we offer is 2Mbit/sec 'Megalink'…that must be five times 2Mbit/sec…over what length was that again?" The result was that a half-million-dollar bill turned up at GP for back rent of the cable. "Larry Hall, the Computer Bureau operations manager passed it around the office and we laughed a lot. Eventually we stopped trying to play 'our minister is bigger than your minister.'"

As GP was still a government department, and the affair affected service to parliament itself, there was some pressure placed on Telecom, which was still an SOE, to be more reasonable. "The back charges were quietly forgotten, but the best deal Telecom was prepared to do wasn't good enough. We installed a 10Mbit/sec digital microwave link from Mulgrave Street to the Beehive, which replaced the fibre at a cost of about $70,000. It worked well, except when cranes on the High Court construction site got parked right in the beam."

The partially completed DECUS site was handed over to Richard Naylor at Wellington City Council's CityNet. The GP Office became GP Print Ltd in 1990 and was sold to Graeme Hart's Rank Group, which began focusing on electronically submitted print jobs on magnetic media, via email, dial-up file transfer, or direct connections. "To me, IP represented a solution to the mish-mash of protocols and systems in use for transferring information between ourselves, our clients and between co-operating agencies so everyone could attach to one big network. I began agitating within GP to try to make IP connections to other agencies but it wasn't to be," said Stokes. In late 1991 Victoria University advertised for a network systems manager, and Don Stokes was off to a role that would enable him much greater freedom to pursue the IP revolution.

PIONEER PUTS WELLINGTON ON INTERNET WORLD MAP

"Ask Net luminaries like Vint Cerf or Steve Cisler[35] for models of community networks in action, and they will tell you the US has a lot to learn from the example set by Richard Naylor and Wellington City Net. Depending largely on goodwill and with virtually no budget, Naylor has chalked up a remarkable string of firsts. Thanks to his efforts, Wellington was one of the first cities in the world to put documents such as bylaws on a gopher server. Most recently, Naylor used his trusty Mac, some fiber (probably number eight), and CU-SeeMe to feed a televised choral music festival from a Wellington suburb onto the Internet – a month before the Rolling Stones concert on Mbone. 'I had a lot of fun with that,' Naylor grins," Bob Johnstone, Wired *magazine, November, 1995*

Richard Naylor: CityLink founder, designer ,and sometimes installer. "The original vision for CityLink was to set up a ubiquitous information utility and take it to all homes in Wellington. But the US venture capital market had slowed, so we scaled back our vision to the central business district. Our aim in bringing broadband into the city was to create economic development and jobs - and it has done that." Photo: CityLink.

Richard Naylor is one of the true Internet pioneers. His constant innovation and refusal to accept that certain things can't be done helped put Wellington City Council (WCC) on the map as the first local authority in the world to deliver council information on-line as a free public service.

It was through his exploration of communications technology in the 1980s that many local councils got their first glimpse of the Internet, and Wellington led the way in delivering independent broadband communications through laying dark fibre across the central business district (CBD).

In the early 1980s Naylor had been with Wellington's Municipal Electricity Department, a division of the City Council, where he learned that RS232[36] could not only connect computers together but that he had the skills to make this work. "I used to get dragged into all sorts of projects that had nothing to do with being an electrical engineer and eventually became the council's IT manager. I felt they needed guidance with what was clearly happening with technology."

WCC was a huge and diverse organisation, spread around many departments and locations. There had been an extensive council network since 1980 and it was up to Naylor to use technology to create efficiencies. He took up his new role on returning from the United Kingdom, where he had been working at Westinghouse using SCATA (Supervisory Control And Data Acquisition),[37] so networking

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wasn't new to him. He inherited responsibility for an IBM mainframe and six DEC VAXes. There were separate computers for rates, design, planning, and other council functions which relied on other computers to get their data. Consequently there were many inter-machine links.

In 1986 it was decided to cluster the machines and create what became known as CityNet, which opened the way for public Internet access and helped wean the corner off Telecom's Pacnet network and opened the way for internetworking. Then Michael Newbery from Victoria University asked Naylor whether he knew that connecting to a certain address would get the council out onto the Internet. The council was already getting Usenet news through Victoria University, and in establishing an email gateway discovered the Newsnet dial-up feed was on for 18 hours a day. Naylor began looking for something faster and more accessible. The council already had fibre-optic links between buildings, including the Wellington Regional Council headquarters. After discussions with the IT manager, and Andy Linton at Victoria University, it was decided to create an internetwork so everyone could talk to each other.

Naylor believed that with the right internal and external network connections there was an opportunity to provide a better service to ratepayers. "People from the Hutt Valley were coming into Wellington to work so why couldn't they pay their rates in Wellington and make that transaction over a network?" The WCC owned an electricity company, bus company, abattoir, and milk company. "The milk company had merged with Tui Milk and so suddenly we were servicing a milk plant in Palmerston North and one in Otaki. We had data circuits there, so all we needed was a phone line and a modem to provide dial-up access."

In his inimitable fashion Naylor set about making arrangements with the IT managers at Christchurch, Levin, Otaki, Palmerston North, and Auckland councils to establish leased lines between the various points in return for Internet access. "In the quid pro quo these guys were getting their first look at the Internet," Naylor said. Email and Usenet news were the big drivers, as many had DEC VAX mini computers and were also able to share DECNotes, which supplied news and information from the DEC channel. From there local authorities started swapping email addresses and seeking broader connections.

Where possible, Naylor tried to pitch the council ahead of the curve. "We had our own cash receipting system; when a cheque was handled we would put it through a reader that could recognise the MICR font[38] and record this on our payment database. If a cheque bounced we could pull it back straight away. We had been automatically producing lodgement slips for the bank since about 1985 and direct debiting using magnetic tape. We had been trying to get the banks to do this electronically but they didn't want to talk about that."

The council had also done some work with the Valuation Department. "The computer at Valuation would print out this little blue slip saying who the new owner was each time a property sold. Then they would mail it to the council which had a full-time person keying this data into its own computer, and then putting the slips in the right order in a filing cabinet. It didn't take much intelligence to say, 'Why don't

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I get your computer to talk to my computer and that person can go and do something useful?'"

Once again, in the interests of efficiency, Naylor had in 1988 been looking for technology that would give people access to current rating or encroachment information on properties they were going to buy. "Typically you would join the queue and go all the way up to the counter and the person would bring it up on their screen, hit the print screen button and charge you $5–$10." He knew PCs were becoming widespread and that about 10 percent of real estate companies had modems. "If we could actually get those people to dial into the council to get that information off the computer, lawyers and estate agents wouldn't have staff members walking through town and waiting in the queue at the front counter."

That's when Naylor latched on to the FreeNet[39] concept, which had some success in the medical and other fields in the United States. He tweaked the model to provide a free dial-up service for ratepayers to access what was essentially public information. As FreeNet already provided information about terms and conditions and how to manage big modem banks, Naylor convinced the council to give the go-ahead and the public face of CityNet was born in 1991. In fact WCC became the second local authority outside the United States to offer such a service. Initially it ran at 24kbit/sec through its DEC VAX computers. The following year that increased to 48kbit/sec.

About that time the council, under Naylor's guidance, also introduced a Gopher[40] server to put council information on-line. It started with council minutes, bylaws and district plans. Gopher was very similar to the Web except it had a structured tree menu system rather than hyperlinks. It used mainstream Internet tool Veronica[41] to search all the Gopher servers, and WAIS (wide area information service), a free text search engine otherwise known as Z39.50, which conformed to library standards. That allowed Naylor and his team to create free text databases. He later discovered this was also a world first. "I went to a conference in the States in about 1992 and someone came up to me from New York Library and thanked me for the Gopher service. They'd been having problems with vagrants actually living in their public library and didn't know how to get them out. They found Wellington's bylaws actually covered that, and cut-and-paste these into their own bylaws."

The initial reason Naylor put the bylaws on-line in was to help Lorraine Baxter, who had responsibility for tidying up the legal and administrative issues ahead of Wellington's once-annual V8 street race around the CBD. "She had to make sure everything was completely compliant with the bylaws because there was opposition to the race and the central records people held the internal copy of the bylaws. If you borrowed it you had to return it the same day but because they were building the Civic Centre we were all scattered around the precinct and it took ages to get across the road. In the end I tracked down the city solicitor's typist, who held the bylaws on her PC and got her to email me a copy. We put it on the Gopher server so Lorraine Baxter could actually search them and work on the bylaws without having to go back and forth each day. That's what triggered it all off."

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When Naylor reviewed the statistics of who had been using the system, he discovered many other councils had amended their own bylaws by reviewing what Wellington had put on-line. "A friend of mine was an IT manager at Dunedin City Council and he admitted that when they were reviewing their bylaws they spent all their time searching ours."

In effect Naylor had become something of a renegade within the council system, breaking down traditional walls and creating new ways of doing things, long before councillors got to vote on them or bureaucrats put a halt to his ideas. "We didn't necessarily tell them. We did these things basically as an internal improvement. I mean no one really noticed. Remember the era when we had typing pools, rooms full of women smoking, typing letters and making changes to all sorts of documents? If you wanted to change something you marked it with pencil, took it back to the typing pool and they retyped the document. By giving them Digital's *All In One* word processing we started to empower staff to use email and type up documents themselves. Without going through a restructuring process the typing pools disappeared and all the typists became something else; they became personal assistants or executive assistants. And no one noticed the transition."

By 1995 CityNet had more than 3000 users, who besides using the Internet could browse council minutes, rates information, building restrictions, and zoning bylaws. The following year the council stopped taking on new users, believing its services had essentially been superceded by the Web. While WCC continued taking its Internet feed through Victoria University, Naylor hooked up directly to the Waikato international gateway in November 1989. He didn't start fully using that capacity until the council launched its own metropolitan-area fibre network, known as CityLink, on 7 January 1990. "We had it in pilot mode for a long time before we announced anything publicly. We didn't want to stick our head up too high."

Writer and technologist Richard Hulse explains the events in Wellington as he saw them unfold:

A city-wide Ethernet opens up a world of possibilities, from letting companies share data across sites cheaply to saving ISPs from crushing demand when a local site hosts a Webcast all the users want. Wellington, the capital city of New Zealand, has one of the oldest and possibly largest distributed Internet exchanges in the world. It is built on top of the Citylink public LAN infrastructure.

Back in the 1980s, Richard Naylor, then IT manager for the Wellington City Council, was stuck with a common but difficult problem – an over-utilised VAX cluster at one data centre and an under-utilised one at another centre across town. He came up with an idea that was unique for the time: run a fibre-optic cable between the two council buildings and share processing resources that way. The idea was so new that a jointer had to be flown down from Auckland to do the splices on the now-ancient slotted core cable.

Naylor set up a 10Mbit/sec Ethernet connection using DECBridges, and the network itself was running DECnet on a 10-base5 and a little 10-base2. Terminals comprised most of the load at the time, as PCs didn't network. The overall idea worked, and the system was

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upgraded to 10-baseT in 1989, with IP being added. In the early 1990s, Naylor's idea caught the attention of then Mayor Fran Wilde, who was intrigued by what Naylor and colleague Charles Bagnall had been up to in what was called "their spare time." Mayor Wilde had attended a local secondary school production and noticed that it was being streamed live on the Internet by an off-duty Naylor. Wilde soon came to understand what was possible, and that their design and the use of fibre could to provide a broadband infrastructure for the city.

This became a key part of a 25-year strategy for Wellington City. Soon after, 17 investors, including the council, came up with $5000 each, and three drums of fibre optic cable were run from one end of Wellington City to the other. The cable was run along overhead trolley bus electric support cables during November and December 1996. The primary aim was to provide an infrastructure to enable greater growth within the local business community. In the first few years, CityLink expanded at a rate of 100 percent each year, doubling the number of connected buildings. At one point, the team connected 50 new buildings in ten weeks.

In 1997, Naylor left the council and helped set up CityLink as a separate company. The first customers were government departments and financial businesses… Later customers included publishers and IT companies. ISPs were there from the start too, with many using the fibre infrastructure as a way of providing genuine broadband to city customers at a low cost. I should note here that CityLink does not consider domestic 1Mb and 2Mb connections to be broadband; it prefers to start at 10Mbit/sec. CityLink can provide 10Mb, 100Mb or 1000Mb connections anywhere on the fibre infrastructure. Nearly ten years after the initial cable was positioned, around 50km (30 miles) of cable exists within the central business district of Wellington. More than 300 buildings are connected.

CityLink now offers two major services, dark fibre and Ethernet. Dark fibre services allow point-to-point connectivity between buildings. Each customer has sole use of his or her own strand of fibre and can connect whatever gear is required on either end. Dark fibre runs up to 1Gbit/sec at present. The Ethernet services are the most widely used and allow customers to connect to a city-wide "shared Ethernet."

Through the use of dark fibre CityLink created a sophisticated high-speed network around the Wellington CBD. "I had been putting fibre around the city since 1988. Some people told me it was illegal at the time but strictly speaking I was still an engineer at the MED so I could use an electricity licence to do it. It's a bit depressing when you look back and see how long these things take," said Naylor. He was extremely proud of what CityLink had achieved and decided to subtly showcase those capabilities at an upcoming TUANZ[42] conference at the Duxton Hotel in Wellington. He and associate Charles Bagnall thought this was the ideal place to give people a taste of what technology was capable of, and to demonstrate the first independent broadband network in the country.

"I put in copper cabling and what was supposed to be a temporary fibre-optic cable[43] to the Duxton Hotel, in conjunction with Tony Warren from Alcatel, who was lobbying to supply Telecom with ADSL technology. Sun Microsystems had a Sun server which

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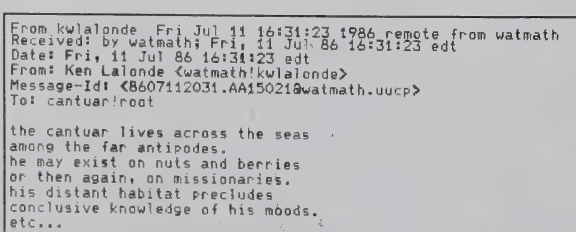
delivered video over ADSL from the WCC into the TUANZ conference. No one said 'What the heck is this?' No one said 'Whose cable is this?' No one, it seemed, gave a hoot," recalled Naylor.

"I think on stage TUANZ president Don Wallace got me to demonstrate VoIP using VocalTech equipment and it was a complete disaster, mainly because I rang the wrong number. But the point is we did all this stuff and TUANZ was more interested in talking about number portability. I look back now 17 years later and see we're actually about to get number portability and we're finally working up to broadband but did it have to take 12 years to happen."

In October 1994 Naylor ran a Webcast from the Michael Fowler Centre of the Tawa Schools Music Festival with three students operating the cameras. He put the tape through a vision mixer and fed it into a Macintosh, a Unix box and then onto the Internet. "We used CUCME software and a lot of string and rubber bands to get it to that stage and we were lucky to get away with it but it worked. We had 16 viewers in 12 countries. It wasn't exactly large scale but for that era it was quite good. Very few people in the world had attempted this before." At this stage Mbone tools were just starting to emerge, a 20-minute segment of a Rolling Stones concert in November was delivered live over the Internet and once it stopped transmitting ut some other guys saw the opportunity and picked up the feed, thanking the Rolling Stones for opening for them before broadcasting their own show, said Naylor.

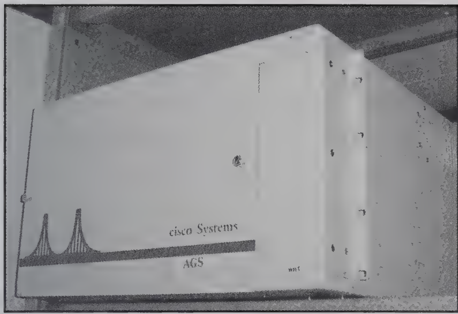
The following year Naylor positioned a Web camera on Mt Ruapehu when it was showing signs of activity. "There was no software to send images to the Internet so we had to write it. I borrowed Jim Higgins' laptop, Telecom loaned us the cellphone, I acquired a city council video camera, used my tripod and a video capture card from Pat Kelly at APT. A PC server downloaded an image every 15 minutes and we had about three million hits in three months. We knew we had a worldwide audience and essentially proved we could do it."

Naylor was surprised that 13 years later more use was not being made of Web cams and streaming video to broadcast niche events such as high-school rowing, netball, and other non-mainstream events. "Ideally, with enough broadband people should be inspired to create new businesses and make Internet shows anywhere in the country. YouTube and Google Video certainly have opened up that possibility," he said.


From kwlalonde Fri Jul 11 16:31:23 1986 remote from watmath
Received: by watmath; Fri, 11 Jul 86 16:31:23 edt
Date: Fri, 11 Jul 86 16:31:23 edt
From: Ken Lalonde <watmath!kwlalonde>
Message-Id: <8607112031.AA15021@watmath.uucp>
To: cantuar!root

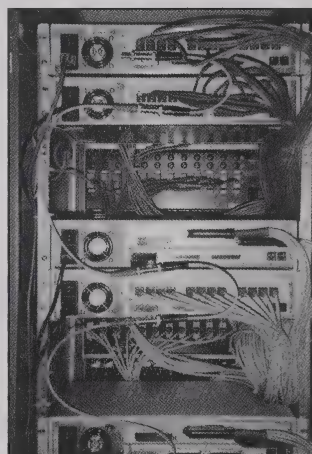
the cantuar lives across the seas
among the far antipodes.
he may exist on nuts and berries
or then again, on missionaries.
his distant habitat precludes
conclusive knowledge of his moods.
etc...

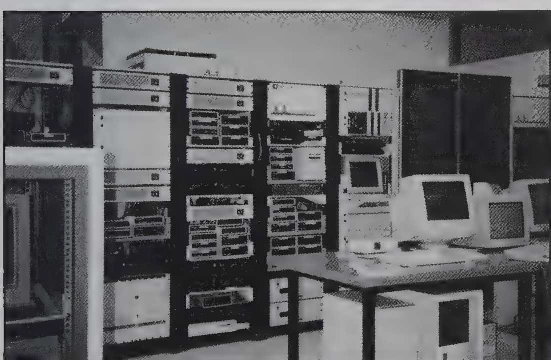
LEFT: The very first email sent by Robert Biddle from the Computer Science Department at Canterbury University in 1986 using the Cantaur connection established with the Mathematics Department at the University of Waterloo in Canada. Photograph: Tony Dale.



ABOVE LEFT AND RIGHT: The first Cisco router in New Zealand was installed at NetLink. It was one of the first of five purchased by Victoria University and commissioned in January 1989. However Cisco couldn't provide sufficient chassis, so three routers were placed into a single chassis with the MGS/2-4E on the back scratched out and replaced with 4E in pen. It had a CSC/2 processor card with a 68000 processor, 1Mb of memory, and two dual-Ethernet line cards. It was installed in the Old Kirk machine room, where with the addition of a 4-port serial card it connected the Kawaihiko network links to the University of Waikato, Massey University (both 48 kbit/sec), and a backup link to the University of Canterbury (9600 bps). At this stage, the total Internet bandwidth out of the country (landing at Waikato University) was 14.4 kbit/sec. In 2007 this router was still found to be in good working order. Photo: Don Stokes

RIGHT: Dial-in modem pool. The modems are CTL Comets, and could go to 33kbit/sec and came in rack units of 12 with power supply. "CTL originally just made stand-alone modems; I asked them to have a go at building a rack-mount version, and we took delivery of the first one in 1994 and bought a few more after that," said Don Stokes. The modems were 'stuffed' into the front of the cabinet, wired to terminal servers at the back, with the cables, power, etc. in the middle. The terminal servers were early production Securicor 3net gear. Photograph: Don Stokes.





LEFT: Victoria University machine room in late 1997 with the NetLink dial-in modem pool; and the VUW modem pool in separate right hand cabinets. The 'IQ' routers are all Securicor 3net routers (now Allied Telesyn) including two supplied as 'ACE Routers' by Network Dynamics (bought by Securicor), which were descended from the DSIR Network boxes. The cabinets are all recycled from other equipment.

Photograph: Don Stokes

5

Selling the family jewels

Telecom holds back the tide

Inevitably the world will be linked by broadband networks and if New Zealand gets a leading edge this could help us move from the traditional primary production sector into value added industries capable of matching international niche market demands. Computing and communications technologies will generate an entirely new way of life where distance and international markets will no longer be an impediment to product development.
Dr Ian Forrester, New Zealand's chief scientist, January 1992.[1]

In 1989 the statutory monopoly status enjoyed by the old Post Office was completely removed, allowing anyone to compete with Telecom. There was a change of management, an extensive round of restructuring and cost-cutting with hundreds of jobs axed, and the replacement of outdated systems.

With the sale of Telecom now clearly on the agenda, and a major shake-up occurring right through the public sector, nothing seemed certain any more. The government was making a major investment in Telecom that included installing high-capacity fibre-optic cables with up to 72 fibres around the CBDs of the main cities, and establishing its first mobile network, which had 2300 cellular 'brick phone' subscribers by the end of the year.

Telecom announced with great fanfare a new service for data connections called integrated services digital network (ISDN), which could integrate voice and data services over 64kbit/sec data streams. What did it mean? Well, for many years afterwards some cards in the industry insisted 'I still don't know.'

In 1990 Telecom sacked a further 10,000 people and announced a $300 million profit. Meanwhile it was inundated with customer complaints about double billing from its locally developed integrated customer management system (ICMS) billing system, now costing $73 million – triple the original budget. The monopoly carrier still found $2 million to spend on a PR campaign to try to ease public concerns. It also made sure to give the impression that cutting-edge solutions would soon offer businesses and consumers everything they'd dreamed of. The new dream technology, it said,

would be better than anyone could imagine – two channels of 64kbit/sec ISDN would be rolled out but also 'broadband' ISDN (30 x 64kbit/sec channels) should be available to all New Zealand homes and businesses by 1995.[2]

On 14 June 1990 the government signed an agreement with Bell Atlantic, Ameritech, Faye Richwhite, and Freightways to purchase Telecom, and then sell down 40.1 percent of the shares over three years, with the goal of maximizing the level of New Zealand shareholding.[3] Telecom was sold for $NZ4.25 billion, the biggest business deal in New Zealand's history, and the sixth-largest deal in the world that year. Part of the arrangement was that the new owners would abide by the 'Kiwi Share,' an undertaking that free local calling would continue for residential customers; rental for a phone line wouldn't rise faster than the cost of living unless Telecom's profits were unreasonably affected, and phone-line rentals for residents in rural areas would not be higher than in the cities.

"One of the radicals' (Labour Government reformists) most unpopular decisions was to sell off government monopolies – including the shipping line, the railroads, and the telecommunications companies – most of which were bought by foreign, mainly US, firms. Opinion polls showed that up to 90 percent of residents opposed the 1990 sale of Telecom New Zealand to a consortium led by Bell Atlantic and Ameritech. But what people mostly objected to was foreign ownership – there was little love lost on the old phone company.

With a payroll of 24,500 employees, the monopoly was grotesquely overmanned. For example, it had one department devoted to maintaining its fleet of motor vehicles and another to making furniture. It even had a special section whose sole function was to deal with telecommunications complaints – of which there were plenty – sent to members of parliament. In the central business district of Auckland, home to almost one-third of the population, lines were so clogged that you could hardly make a call after 10 a.m. The average wait for installation of a new phone line was 48 days," Bob Johnstone, Wired *magazine, November 1995.*

The government insisted the sale of Telecom would help pay off growing public debt and ensure consumers a better deal. The year before the market was fully deregulated Telecom chief executive Dr Peter Troughton in a letter dated 8 June 1988 to SOE Minister Richard Prebble, described a transparent company structure comprising six regional companies and a separate long-distance subsidiary. Within this structure, potential competitors would be able to make "realistic judgments" in which "charges for interconnection will be based on costs" and "the details of specific charges will be available to the Commerce Commission if required."[4]

RIGHT: Peter Troughton, the British privatisation expert and first managing director of Telecom NZ addressing TUANZ '90 about the future of Telecom. TUANZ Archive.

FAR RIGHT: Richard Prebble, associate finance minister in the Labour Government 1984–1987 and chief architect of the Telecom sell-off.

The reality leading up to and after the sale was very different. Public debt and consumer frustration continued to rise. There were now more complaints about Telecom than any other business. In fact in 1990 a special unit within the Commerce Commission was working overtime dealing with complaints about Telecom. Among the complainants were six businesses battling the obstacles placed in their path as they attempted to compete in the newly deregulated marketplace. They brought action under Section 36 of the Commerce Act, which covered anti-competitive activity and the legal battles continued for years.

PICKING UP THE PIECES

When the National Party came to power in October 1990 under Jim Bolger, it faced technical, legal, and competitive chaos in the aftermath of the Telecom sale. Minister for Information Technology Maurice Williamson was often criticised as the 'hands-off' minister who refused to take the approach many thought necessary to ensure a fair deal for Telecom's competitors in the emerging market. "The thing that no one really understood about the Telecom sale was how bad the privatisation had been in terms of stuffing up what needed to be done.[5] During the course of 1990 the big debate was raging in the Labour Government with Prebble and Lange and others about whether they should privatise the whole shooting box or just the competitive bits of Telecom like long-distance calling, overseas calling, data networks and cellular and keep the local loop as a SOE. Helen Clark was deputy prime minister and Michael Cullen was the associate minister of finance, so it's not like it was different people," recalled Williamson.

"However the argument Prebble kept putting up was, 'If you do that, you'll either get low bids or no bids; we need the money.' Treasury thought the company was worth $2.6 billion, and Prebble said if we wanted to get that, or possibly even more, we had to sell it unencumbered by all sorts of rules and regulations. He actually went to Cabinet trying to fight for the sale to have no rules and regulations, not even the Kiwi Share. In the end, the conditions in the sale document; universal service, no more than CPI increase, free local calling, were mainly driven by Lange and others who had a phobia about foreigners owning the phone company and having total control."

Prebble later said he insisted on the Kiwi Share to give the necessary protection, but he wasn't in favour of it to start with, although the government was happy to accept the $4.25 billion cheque. Williamson said a number of the big finance houses (including Bloomberg and Merrill Lynch) believed the new buyers had overpaid dramatically for the company. "They knew that if they put in the rules or regulations and said you must open yourself up, and there's an interconnection regime about who else can use the local loop and so on, they'd get nothing compared to what they did."

Only a few months after the deal was done Labour was out and National was in, with Williamson as IT minister. "I'm sitting there thinking, I'm a huge bloody respecter of property rights, and if somebody has gone and paid $4.25 billion for a property right without any rules or regulations, it's a bit rich for the people who then sold it to say, once the cheque was banked and cleared, there are quite a few rules we're going to put around what you can and can't do." In Williamson's own words, he was 'stuffed' even though in his personal view Labour should never have privatised the local loop part of the business. "It's a natural monopoly, it will never be anything but a natural monopoly, and we've spent at least 18 years trying to argue about how you get that natural monopoly back."

One way would have been to buy back the local loop, perhaps returning the purchasers' $1.5 billion. "That would have been a perfectly sensible thing to do but I can tell you now Ruth Richardson would have looked at me and said: 'I don't know what you've been smoking, Mr Williamson, but it must be bloody good stuff because we're not buying back public utilities. On the back of everything else

we've got a deficit on our hands of ginormous proportions.'" Indeed, during the Treasury briefings of 1990 it was clear the country had a multi-billion dollar debt which was only going to escalate the way the previous government had been spending. "We had gone out and promised in the campaign that we were going to put out 1000 extra police on the beat, get rid of student fees and that the surtax would go. If you put all those on, the cumulative debt that we would have encountered in our first term in government would have been over $12 billion."

In 1991, as arranged, Bell Atlantic and Ameritech took up their 98 percent shareholding in Telecom, which was promptly listed on the New Zealand, Australian, and New York stock exchanges, the new owners offering 724.5 million ordinary shares at NZ$2 each. While moving rapidly away from the legacy of the tired old Post Office network, the more commercially focused Telecom raised eyebrows with a price hike. From November its Megaplan (2Mbit/sec premium ISDN service) tariffs rose 114 percent, from $28,000 to $58,000 a month. Regardless, it got the contract to connect PBXs between the United Building Society offices in Christchurch and Auckland with a $500,000 Megaplan voice and data link, aggregating 30-ISDN channels.[6] TUANZ and ITANZ (Information Technology Association) members were aghast at the cost and slammed Telecom for its second huge increase. In August a call was made for the Commerce Commission to investigate the monopoly carrier for 'making excessive profit and using anti-competitive measures.'[7]

Meanwhile in 1989 the Alternate Telecommunications Company, a consortium involving the local Todd Corporation and the state-owned Railways Corporation, in partnership with US telecommunications company MCI, had been granted network-provider status. It planned to create a nationwide network using the fibre-optic cabling that straddled the main railway lines. In its opening gambit it installed two 512kbit/sec circuits to Hamilton, terminated in state-of-the-art Cisco 4500 routers. It immediately began battling Telecom over an interconnection agreement. An 'in principle' agreement was reached by August 1989 but six months later final details were still being debated. An ownership change equally shared by TVNZ, Todd Corporation, MCI and, British Telecom resulted in a name change to Clear Communications, which finally began offering a full tolls service on 1 April 1991, exactly two years to the day since deregulation. A number of issues including rural connection remained outstanding.

Another entrant that looked as if it had potential to make a difference in the market was the Kiwi Cable Company on the Kapiti Coast, which announced on 1 June 1989 that it had registered as a network operator. Days later, in a grand preview of what might evolve in this most deregulated of environments, New Zealand broadcasting and telecommunications experts engaged in an interactive satellite-based videoconference on 6 June 1989, between Victoria University and Ohio State University to discuss the opportunities offered by the deregulated environment. The Wellington students had been exchanging emails with their US counterparts using the Bitnet service and voice connections. They were simulating what life might be like if widespread broadband ISDN were available in an effort to help students come to terms with the 'overall electronic communications environment which would be at the heart of university education in the future.'[8]

International options were opening up as well. In September an agreement to connect the 124,000km, 560Mbit/sec PacRim loop into Hawaii with the Tasman 2 cable between New Zealand and Australia was signed, giving even greater credibility to the hi-tech dreams the optimists were enthusing about. In its Vision 2000 plan Telecom boldly declared it intended to deliver for full optical switching, wireless broadband, ISDN, metropolitan networks running at hundreds of megabits per second, on-demand integrated broadband and mobile services. After four years of talk it finally announced a basic rate ISDN (2 x 64kbit/sec) service, which, apart from the high subscription and user costs, had additional fees now that local business call charging had been introduced.

With deregulation supposedly creating a more open environment than anywhere else in the world, talk turned in earnest to maximising the opportunities, particularly in telecommunications, where the terms Internet and World Wide Web were shifting from arcane usage to mainstream conversation. Since 1988 the Internet had doubled in size every 6 to 15 months. The ever-expanding, decentralised network of networks now spanned 50 countries. A Moscow physics laboratory and computer programmers co-operative became Russia's first connections late in 1992 and Ecuador and Turkey were connected in early 1993. By mid-1993 the Internet comprised 11,000 connected computers being accessed by an estimated 10 million people.[9]

The term 'information superhighway,' coined by US vice president Al Gore in 1991, evoked hi-tech alternatives to the railroads and highways that cross-crossed the globe during the industrial revolution. Now the pace of technology and the speed of roll-out of new overland, undersea, and satellite links were moving the world inexorably into the dawn of the information revolution.

The market was changing fast. Pay TV company Sky Television was now broadcasting on the UHF band and Canwest, owner of TV3, launched its second free-to-air channel, TV4. Aware of the burgeoning on-line market in other parts of the world, Fujitsu entered into a partnership with CompuServe, with a plan to set up two large databases in Australia and New Zealand. It had 700 users across both countries and believed it would have 100,000 local users within five years. There were whispers of a second mobile carrier entering the market to compete with Telecom's 025 network, which now had around 58,000 subscribers.

Many alternatives were appearing on the data distribution dial with, now you could fax it, microwave it between buildings, beam it from a satellite dish, packet switch it, EDI it to an electronic mailbox, broadcast it on spare TV or FM signals, send it via modem down the telephone wires, PABX it down a leased line, let the bureau update your systems overnight, or simply post it using NZ Post. A 'work in progress' sign was up over the broadband infrastructure and while ISDN was being talked up at every turn, true competition in the data market was still an urban myth, and there was no sign of the government or Telecom taking the Internet seriously. Talk of the imminent 'convergence' of computing, broadcasting, and telecommunications only added to frustrations.

STILL LOOKING FOR BACKBONE

From the early 1990s the development of an Internet backbone in New Zealand was heavily dependent on the willingness of the universities and research organisations to sew their patchwork developments into a cohesive whole. There were still many different types of incompatible networks in operation.

With Waikato University now operating as the central gateway for the Internet in New Zealand, and universities across the country eager to share links to the international academic and research community, it was time to formalise an administrative body. A preliminary meeting of heads of university computer centres and computer science departments was held at the Rankin Brown building at Victoria University early in 1990. The big issue was who would lead the way forward. Neil James, who chaired the meeting, asked: "How would we formalise what had previously been informal, instead of the Computer Science Department at Victoria University being the centre of connectivity? We needed things set up on a more professional basis."

They agreed to establish Kawaihiko; loosely the 'the shoot or, knowledge or enlightenment'[10] in the Maori language, under the auspices of the vice chancellors' Standing Committee on IT. Its goal was to "grow a vision on behalf of New Zealand," and it was agreed everyone should aim to move to the common TCP/IP protocols as soon as possible to ensure traffic flowed seamlessly. The Kawaihiko network began operation in April 1990 and the remaining universities, who had been struggling for

various reasons to get on board, agreed to replace their 'number 8 wire' PC-router links with 9.6kbit/sec leased lines to the network, which were in place on June 14.[11]

When New Zealand's first international Internet link was established in 1989, its share of the costs was divided equally among six universities. As the costs of the international bandwidth consumed by different organisations could be highly disproportionate to the relative capacity of their links to the gateway site, volume charging for international bandwidth based on traffic to and from each university was adopted late in 1990. To achieve some 'predictability,' charges were based on bands of traffic use. A site using between 200Mb (megabytes) and 300Mb of international traffic a month would pay a set fee so long as their traffic remained in that band. If their consumption exceeded 300Mb for a single month only, no additional charge would be made. If it exceeded 300Mb for a second consecutive month, they would be charged on a higher use band. This system was subsequently revised, but each university, and later each of the three distinct research and education networks, paid a share of the cost of international bandwidth closely related to its use of that bandwidth.[12]

There was a glimmer of hope that the government might step in and provide funding for the science and research network around the time the National Library joined up with Kawaihiko. Gateway manager John Houlker said interest in helping relieve the pressure on maintaining the research backbone came when Dr Ian Forrester, the first chief scientist of the newly formed Ministry of Research Science and Technology (MoRST), accompanied him to Hawaii for a PACCOM meeting in 1991. "He got the idea very quickly. He guided us to funding for collaborative research projects within the research sector." After Forrester left, the understanding within the Ministry of Science about the Internet vanished, according to Houlker, until Phillip Lindsay, the chief information officer at MAFnet, pointed out an opportunity for funding and prepared a bid on behalf of the research and academic community.

FALSE POSITIVES

A directive from Cabinet in 1991, ahead of a major restructuring in the academic and research sector, stated that funding would be provided for science and research organisations, universities, interested government departments, and the National Library to form a national computer network. Phillip Lindsay used the opportunity to get all the parties to try to form a national research network. A large gathering of heads of departments and interested parties was called to expound on the merits of the idea and a steering group was formed to develop a proposal for Cabinet. "We worked out how it could be developed but then there was this big dust-up. The DSIR had developed its own networking equipment, which it wanted everyone to use, but MAF and the universities preferred to use Cisco, the up-and-coming networking company. The DSIR people made it really difficult. In fact a mediator was even called in to try and get an agreement between the parties," explained Lindsay.

A week before the deal was to be signed the DSIR made a separate bid to the Ministry of Science, saying it had a better way of doing things; rather than a joint project with the universities, it should be running the Internet. The lack of agreement undermined the proposal and while some funding was made available to the universities for basic equipment and DDI links, it was nowhere near the original application. DSIRnet got funding for new networks and the national network ended up with a combination of different routers. "We were grateful for any crumbs we could get in the end," said Lindsay. The failure to agree on a strategy to attract the promised funding further exacerbated existing tensions between the universities and the DSIR.

According to Network Wizards, 1193 people in New Zealand were connected to the Internet in 1991 and 535,000 hosts connected worldwide. In anticipation of increased use of the international

gateway the satellite link between Hawaii and Waikato was upgraded from 9.6kbit/sec to 14.4kbit/sec. Then in July 1991 traffic growth between Victoria and Waikato universities, the two busiest nodes on the network, resulted in those leased line links being upgraded to 48kbit/sec. In February 1992 the satellite link to Hawaii was replaced with a 64kbit/sec link to NASA's Ames Research Centre in California.

A nz.netstatus posting on 3 March 1992
(Message-ID:
<1992Mar3.110908.6750@waikato.ac.nz>) says
>We are expecting to have sun outages affect circuits from
>NASA Ames to Australia (AARNet, 139.130 net) and New Zealand (Univ of
>Waikato, net 130.217) for the next 4-5 days (March 1-5, 1992).

Initially there were bottlenecks everywhere in the universities' Kawaihiko network. Every effort was made to cache or archive anything from offshore that the local community might be interested in. Newsgroups and whole FTP archives were downloaded when capacity allowed and stored on a succession of 500Mb disks for others to access.

Victoria University had a close relationship with the DSIR, but sharing DSIRnet capacity to get across the country to the Waikato gateway wasn't always efficient, Mike Newbery said. "They didn't have a lot of capacity available during the day and I recall one time having to wait until 2am to download a 1Mb patch for the TRW terminal server. We had asked Telecom to run the network for us but they simply weren't interested in what we were doing unless they could sell their existing products. I had a number of conversations where I would ask for a certain amount of bandwidth and they would offer a tenth of the bandwidth I wanted at 100 times the price I wanted to pay, then offer a whole lot of added value services we didn't want at any price."

Newbery's requests often met with incomprehension from both carriers. He recalled after one Kawaihiko meeting, when it was obvious something needed to be done to provide much higher capacity for the network: "I had just returned from a conference in Scandinavia where the government supplied the academic network Nordunet with dark fibre over which you could run OC48s (155Mbit/sec). Back in New Zealand I had another conversation with Telecom looking to improve our bandwidth. I said OC48 would be nice but I'll settle for E3 (34Mbit/sec). Telecom said 'What's an E3?' So I patiently explained it to them. They said 'we can do anything if you pay for it' and began to talk about vastly inflated prices. I had the same conversation with Clear, which at least had the good grace to look stunned and explained they couldn't do it because they didn't have the facilities."

COMMERCIAL BREAK

Andy Linton's core role in the Victoria University Computer Science Department was still cutting code and acting as postmaster to ensure email got through and the right addresses, protocols, and domains were being acquired and used correctly. However the debt his department had run up continued to be a major pothole in the highway Victoria was developing.

In effect it had already become a de facto ISP in that it was allowing other parties outside the university to connect to the world via its servers and email gateways. The department was in a difficult situation. Telecom wasn't offering it any special deals for use of its data circuits, and there were no acceptable use policies stopping it from moving traffic around the country, so it felt quite justified in passing on some of the costs. In fact the payment it received allowed the department

to 'unofficially' trade its way out of debt and start making a handsome profit.

"We were soon at a point where there was enough revenue coming into Computer Science to not only pay the outstanding phone bill but pay for another staff member. I'm sure we were in contravention of all our acceptable use policies, which stated there was to be no commercial activity," said Linton. Soon the little enterprise began expanding its influence to the broader business community and sharing its knowledge with the industry. Linton and others from the department attended Uniforum conferences to talk about how they had achieved their connectivity. "There was a bit of evangelism going on, if you like. Another piece of the puzzle was that it gave us the chance to talk about the Web stuff that was coming up."

According to head of department Professor John Hine, no-one quite knew what to do with a department that had gone from a debt situation to having a revenue stream of a quarter of a million dollars. "There was no research funding available here in those days. Other universities in the US and Britain got research funding for this kind of thing and didn't have to charge but we had to begin charging per kilobyte; 25 cents per 2000 characters or an A4 page, that would go overseas in three to four hours in the dial-up cycle. Postage was about $1 and a fax call would have been around $5, so it was still very economical."

A growing array of customers would dial in to the banks of modems in the Computer Science Department and at one stage even Auckland University began to experiment and handed its modems over to Victoria to run. It also began a feed to pioneering ISP Actrix, run by John Vorstermans and Paul Gillingwater, out of a garage somewhere in Wellington. They'd been paying Telecom "an arm and a leg" and Victoria offered to help them. He said Victoria sublet them a room. "They moved to the university on condition that they would offer sensible rates for students who wanted to dial up the campus network. That meant we were being paid for renting a room and they were no longer paying for links across the city," said Linton.

Another major obstacle to an industrial-strength academic and research network came when the Crown Research Institutes Act 1992 passed into law, splitting the DSIR into nine Crown Research Institutes (CRIs). While they remained in government ownership, and would continue to undertake research for the benefit of New Zealand, they were required to operate as profit-making enterprises. This was in direct contrast to the DSIR's previous functions: "To initiate, plan and implement research calculated to promote the national interest of New Zealand" and "to collect and disseminate scientific and technological information, including the publication of scientific reports and journals."[13]

The Research Division of MAF was similarly charged to undertake scientific research and extension activities in agriculture, as set out in the MAF Act (1953). While there was little change in their roles, everything now had to be done with the shareholders' interests in mind under the Companies Act. Even though many disputed whether science and research and development could be undertaken on a profit-alone basis, it was simply assumed that the only alternative to the public, service model was the commercial model.[14]

The DSIR and MAF were metamorphosing and the various CRIs that previously had a common voice were now forced to compete with each other. Getting agreement on a common network probably delayed the formation of the new Tuianet (sew together or bound together) management group by about six months. Tuianet was administered by the Tuia Society, which had the mandate for connecting New Zealand to the Internet and the internetworking of universities, the National Library, the CRIs and the Ministry of Research, Science and Technology. Its first links went live in June 1992.[15]

According to Neil James, who continued to chair the meetings, the turmoil around the changes within the new CRIs made a common aim difficult. The people brought in to head up the CRIs

were running separate businesses and looking at how they could sustain this in competition with each other." With hope of further government funding now gone, it dawned on the universities that everything would have to be done within existing budgets.

However, the CRIs still had to network with each other, and access to the international gateway at Waikato was an imperative. The old communications-and-technology issues remained despite political changes. John Houlker was asked to join a project set up by Department of the Prime Minister and Treasury to look at how a common Internet backbone could be managed and where the CRIs would fit in. Houlker recommended frame relay as the underlying 'layer 2' (switching, security, and quality of service) network, which could be managed by a telecommunications carrier, while still allowing Tuianet partners to make their own decisions about Internet routing on the top layer. "There had been a difference of opinion about the Internet architecture we should run and what kit we would use. The DSIR wanted to use the routers they were making and we wanted to use commercial routers being made by Cisco. My concerns were partly tied back to problems I had with connecting DSIR routers in the past which had cost me several months in getting the backbone network operating."

Ideally frame relay would make it much simpler to set up permanent virtual circuits so Tuianet members who wanted to connect could do so at reasonable speeds without any fuss. Houlker had been negotiating with Netway Communications, a joint venture between Telecom and Freightways, and after learning Telecom was planning to launch frame relay urged them to bring their plans forward six months for a pilot.

Tuia continued to work behind the scenes to manage domains and cover all the administration issues relating to ensuring nationwide coverage, and as demand grew, increase the speed and availability of bandwidth. IT staff at universities around the country were now operating Cisco routers, switches, and other advanced equipment required to access and share Internet email, FTP and newsgroup services, and typically knew more about this technology than most telco engineers. In fact Tuianet members had become concerned at the apparent lack of knowledge and even interest in the Internet by Telecom, Clear, and others in the telecommunications market. Few seemed to know anything about IPNetworks. The issue came up again when the group felt it had to take the lead to get better performance for the Tuianet backbone and the international circuit when discussions shifted from leased lines to frame-relay technology. "We had to virtually push Telecom and Clear into understanding and deploying frame-relay technology," said Neil James.

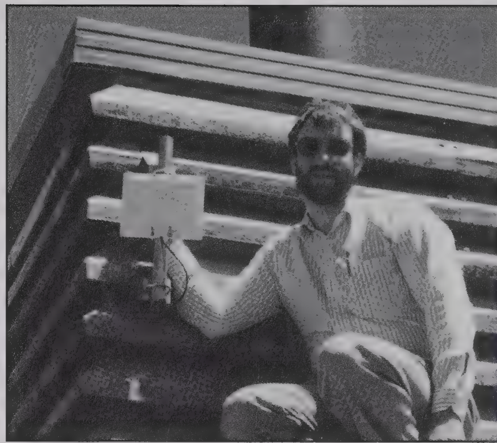
The frame-relay equipment from Netway Communications arrived in July 1992. John Houlker reacalled, "Netway had real trouble managing the frame-relay circuits within the performance specifications customers wanted, as it was designed to burst up in speed, based on demand. "We benefited from that hugely because the way they had it configured we were paying for a committed rate of about 9.6kbit/sec which was quite modest but it ran at 256kbit/sec most of the time." Don Stokes said it was intended as a full mesh network but Netway was using Hughes switches. "This seemed a bit stupid because they weren't easily configurable and didn't have the kind of matching, mapping and traffic management capabilities of the Stratacom equipment they later used."

SCIENCE AS PROFIT CENTRE

The DSIR network group had also been involved in a collaborative project with Netway Communications to implement frame relay across its routers. It was first demonstrated linking a Telecom office in Wellington to the DSIR office in Gracefield. By June 1992, when DSIR closed its doors, the network consisted of more than 70 routers interconnecting over 20 LANs at DSIR sites from Kaitaia to Scott Base. There

were in excess of 50 hosts (VAX, Unix, and Netware servers). The establishment of the CRIs led to the break-up of DSIR's Physical Science's Computer Operations Group and its various computer bureau 'outposts' were absorbed into the dominant institute at each research campus.

The Network Engineering Group was overlooked in the restructuring, and left without a host CRI. A number of options were explored. The group established a staff-owned company – Advanced Communications Electronics Ltd (ACE Routers), with a view to further developing its router technology and other communications equipment, and operating the communications network. After numerous visits to the various CRI implementation managers, it became clear they were not confident such a small company would have the stability required. They would, however, be happy to purchase services, provided the group was operated from within a CRI. After considerable negotiation, Industrial Research Limited (IRL) agreed to become home to the Network Engineering Group, and on 1 July 1992, the DSIR Network became CRInet.



A younger, hairier Don Stokes hanging off the antennae for the first multi-access 2.4 GHz wireless Internet service in the country, around 1996.

An important requirement of the CRInet implementation plan was to establish an integrated research network linking the 10 CRIs with Tuianet. After many meetings, technical staff from the universities, MAFTech, and DSIR Network Operations Group agreed on a solution, recalled CRInet's Dr Peter Whimp. Frame-relay access circuits were installed at each university and at the major research campuses around the country: Mt Albert; Ruakura; Gracefield; Wallaceville; Lincoln; and Invermay. DSIR Palmerston North already had an existing fibre access circuit back to the Massey University computer room.

To foster co-operation between the universities and the CRIs, the network was fully meshed, with committed information rate (CIR) levels chosen to reflect expected traffic flows. Day-to-day operation and management of the network was split: MAFtech retained responsibility for all AgResearch units; the universities took control of their campus connections and the old DSIR network group, now part of Industrial Research as CRInet Operations Group, took responsibility for provision of WAN and Internet services for eight of the ten CRIs. Whimp claimed the Tuianet management group was remarkably open, and higher-level management was undertaken by a committee consisting of representatives of all three groups. The initial implementation was fully meshed, with private virtual circuits (PVCs) between all sites, but it was acknowledged at the outset that not all would be required. About 12 months into the operation a review of traffic patterns allowed a number of circuits to be dropped, and the 'savings' to be funnelled into more heavily used circuits.

Don Stokes, from Victoria University's Computer Services Centre, confirms that apart from the clashes over preferred equipment there were also philosophical differences between the way the DSIR and the universities operated their networks. The universities still operated at arms' length, using the Internet mainly for access to international services. The CRIs were building, operating, and administering their own internal nationwide network and only some of the traffic was IP-based.

"There was never a meeting of minds as to how a national research and education network was going to operate," claimed Stokes.

He describes Tuianet as a bunch of frame-relay nodes talking to each other in what was a watered-down research and education network, but still able to carry internal traffic for the CRIs. It was "a fairly loose confederation" with the concept of "proximal and distal" sites. "A distal site was one that came through one of the Tuianet connected sites which they were then responsible for. For the purposes of charging all the traffic that went through Victoria was charged to Victoria, so we took responsibility for all the networks that were attached to us."

Phillip Lindsay wasn't too concerned about the side issues. His group, AgResearch, was just thankful for the incremental performance boost. The geographically dispersed government agency with five major campuses around the country could finally operate as one. Frame relay was more affordable and certainly faster than X.25. "Tuianet was fantastic. It was the first time those groups had come together and we couldn't have achieved a nationwide network without their co-operation. These were new times and there was new technology everyone was drooling over. It seemed that nothing was impossible. Netway Communications was far more entrepreneurial than its owner, Telecom, and there was a strong commitment from all parties to make this new frame-relay technology work."

With frame relay, participants knew they had a minimum speed to work with, and if they needed more the network could burst up to accommodate that. "In the early days when Tuianet users were the only ones on the network the performance was fantastic and we were getting far more than we were paying for. As a lot more customers came on the performance declined. We had such good performance at the beginning but as it became more commercial we had to start looking at other options," said Lindsay.

Tuianet chairman Neil James said it was soon realised the Internet was not going to remain a private research and education network. "It was going to be a lot bigger than that, so we made this deliberate decision to upskill the communications sector, put our leased lines up for tender and try and get three different suppliers involved." From late 1992 the more robust network, which now connected all seven universities, began operating at 48kbit/sec over Telecom's frame-relay network, with digital leased line links to smaller sites. The increased flow of traffic forced the doubling of capacity to a 128kbit/sec satellite circuit for the international Internet link to NASA's Ames Research Centre in California.

Jim Higgins, information systems director with the New Zealand Audit Department, and a long-time member of the New Zealand Computer Society (NZCS), got a call from Neil James at Otago University who wanted to know if he would chair a group to establish the foundations for a national research and education network, involving all the universities, CRInet and the National Library. Higgins sensed there was something else he needed to know before committing. He called James back asking, 'Is there something you're not telling me here?' and so learned about the conflict, hidden agendas and vested interests, including fears by the newly formed CRIs, that they might be overtaken by the new infrastructure.

There were plans to further boost bandwidth but Tuianet's capabilities, structure and ongoing role were causing some concern. "The idea was that once all of this was put together it would become the backbone of the New Zealand Internet. From the research I did it seemed to me this was the world's first multi-point ATM (asynchronous transfer mode) network. There were point to point networks in the US but no one had run a multi-point at such high speeds as 1.4Mbit/sec," recalled Higgins.

At the Tuia Society AGM later in 1993 it was agreed that the non-commercial organisation was no longer representative of New Zealand Internet users. Internet governance was at a crossroads;

it could no longer be contained within the academic world, and at this stage Tuia was the only body willing to take responsibility.

With Waikato charging Tuianet for international traffic and Tuianet having to pass on costs to its members, it became more important to ensure the accuracy of who was being charged what. Nevil Brownlee from Auckland University came up with a second-generation packet meter. His NeTraMet traffic meter designed to help universities and ISPs with 'traffic accounting' or monitoring and charging for traffic at per megabyte rates was released in October 1993.

Reflecting on that period Neil James said all the Tuianet group wanted to do was act as a catalyst. "I think we succeeded too well in some ways." One of the reasons for the eventual demise of Tuianet was the carriers 'playing games with us.' Representatives of the network began to use the collective buying power of the universities and CRIs to get the best deal possible for leased lines, access to better frame-relay speeds, and other services from competing carriers. "The last time we went on one of those rounds we screwed them down and chose the supplier we wanted for various services. Then both Clear and Telecom undermined the Tuia deal by going out separately to each university. The next time we met as a group we discovered we had lost our collective bargaining and they'd effectively broken our alliance," said James. That's where Tuianet lost control of the development of networking for research and education in New Zealand. "They all went with different suppliers and we rarely met again as a collective."

There was no point in the group appealing to government for help after the divide and-conquer attack by the carriers. "The blame can be laid with the New Zealand Government for not understanding the revolution in communications. It was in no mood to be involved in anything that it thought the market might manage. It's been proven the market doesn't respond well in the area of data networking; nowhere in the world has a totally *laissez faire* open market worked properly," commented James. The hands-off approach, the lack of understanding about where the Internet was going and the refusal to legislate or regulate, he said, meant the government was late to the Internet game.

WEAVING THE WEB

In April 1989 New Zealand became the first Asia-Pacific nation to take a full link into the US Internet backbone by connecting through to the NSFnet backbone via the University of Hawaii. A month later Australia joined the international link and within two years NASA had managed to link Hong Kong, Taiwan, Korea, and Japan to its Asia-Pacific network.

By 1990 ARPANET, the original framework on which the Internet had been tested and proven, was wound up, superceded by the now burgeoning National Science Foundation (NSF) network. As the industrial-strength backbone network for US research and education access, NSFnet was given a huge injection of government funding. The restriction on private access to its backbone was removed in 1992, opening the way for anyone to connect.

The US Government then announced it would leave the development and maintenance of a next-generation Internet to private industry. As the government stepped aside the Internet grew rapidly, spread widely and began to develop depth. New tools and applications appeared, enabling people to create and navigate content; anyone anywhere could now interact with that content and each other.

The Internet had become a huge Web of interconnected sites that still required a relatively high level of skills

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to access and set up a host to send and receive email or download files. The World Wide Web (www or Web), which had come into existence in 1990 as a system for organising information, proved to be the breakthrough that took the Internet mainstream.

From your browser you could type in a specific address (URL) to call up pages containing text, photographs, animations, or links to video or music clips. Any page or piece of information could be linked to any other, anywhere. This ability to locate and link documents, so one document might point to many other documents and sources of information, quickly evolved into an on-line Alexandrian library. The Web browser and a new generation of graphically based tools meant people could use human logic to interface with machine logic and find what they wanted when they wanted it.

The first tools, and the concept that would become the Web, were released into the public domain on 6 August 1991 by Tim Berners-Lee on the alt.hypertext newsgroup. Since 1989 Berners-Lee had been working with hypertext, a means of creating links within and between documents, in order to help physicists share data. His World Wide Web project was part of the Enquire project at CERN (Centre for Physics and Nuclear Physics) laboratory on the borders of France and Switzerland.

Until then, you needed knowledge of specific tools to get specific outcomes on the Internet and you had to know what you were looking for and where you were most likely to find it. Access via computer screen was through text-based command-line interfaces such as Telnet and FTP. Other tools allowing you to retrieve specific information from the Internet included Archie and WAIS (wide area information systems).

In 1990, Archie, the first Internet search engine for finding and retrieving computer files was developed at McGill University, Montreal. Then there was Gopher, which organised files in hierarchical menus, so you would browse through a menu system to more closely identify where the files you were looking for might be. There was no way of searching for words or specific content. Veronica (very easy rodent oriented net-wide index to computerised archives), however, allowed database searches, and by 1993 the combination of Veronica and Gopher had become the most popular way of using the Internet but were still text-based and too clumsy and complex for most users.

Berners-Lee's browser and editor program allowed users to enter a specific domain address or URL to find another web site. Within each web site was a front page with an index showing the content of the site and how to navigate it. Each web site might have many pages and each page many links to other documents from the same server or external pages. Those links would be coded into text on a page. Readers would click through from the link and find themselves transported to the new site or have the page come up on-screen.

The first Web pages site went live in 1992 and the free Web programming language HTML (hypertext mark up language) was released in June the following year. This communal development approach is credited with helping the Web grow so quickly. Although Tim Berners-Lee has gone down in history as the 'inventor' of the Web it wasn't until Marc Andreessen of NCSA (National Centre for Supercomputing Applications) developed

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the graphical Web interface known as Mosaic[16] in 1993 that the Web began to take on a new visual approach. With Mosaic you could search and display pages that looked more like a magazine or newspaper, complete with text, graphics, photographs, and even sound and moving images.

Free trial versions of Mosaic were offered to the educational community. It soon took off and by 1994 was installed on tens of thousands of computers worldwide. Its ease of use meant demand spilled over into business and other areas, particularly as the cost of computers began to plummet, making them affordable for businesses and a growing number of homes.

By the end of 1992 there were 26 Web servers on-line. Two years later there were 3.2 million hosts and 3000 web sites. The number of hosts doubled in 1995 and the number of web sites had reached 25,000. The numbers kept doubling. By January 2001 there were 110 million hosts and 30 million web sites. Microsoft joined the game, releasing its first version of Web browser Internet Explorer as part of Windows 95, on 24 August 1995.[17] By August 2005 there were 70 million web sites and 19.2 billion Web pages. By February 2007 that had reached an estimated 29.7 billion Web pages.[18]

FIRST-IN, FIRST-SERVED KIWI WRITES WEB FAQ

Possibly the first fully populated Web pages put together in New Zealand were created by Victoria University undergraduate Nathan Torkington. He also wrote the first World Wide Web frequently asked questions (FAQ) list to be published on the Internet, and thereafter in numerous publications around the world.

Torkington made his foray into the Internet in 1990 during his first university holidays working at the Computer Services Centre at VUW. He was keen to dive as deeply as he could into the pool of data that was being built up around the Internet and discover the best way to navigate this massive library of information.

"I did all the sort of usual things like Telnetting into MUDs (multiuser dungeon, domain or dimension)19 and BBSs in the States, which was quite a novelty at the time. I got into Archie and Gopher when they came out and WAIS. I was just being a kid. I really enjoyed the connection to other people on the other side of the world and trying all the new bits of software that were coming out. Playing with that kind of wide area type server information system was intoxicating."

Torkington was active on Usenet and ran a local FTP, archive mirroring some core international material including the Simtel 2020 archive and material from Project Gutenberg.[21] He was encouraged by Victoria's computer services director Frank March who sought his help planning a campus-wide information system which Torkingtn ended up running. At that point everyone knew about Archie and Gopher but Torkington pointed them in another direction. "I thought something better was coming and asked if I could show them this thing called the World Wide Web." His first Web page was an HTML view of his FTP archives.

Torkington is quite comfortable declaring that he created and ran the first real web site in New Zealand. "I remember there was a guy at Canterbury who had downloaded the software and put up a 'Wahoo it works kind of site' but I actually stuck information on mine and I got right into it. I was part of the WWW Talk mailing list which was where all the software developments happened in those days." He became a regular on that mailing list, posting questions, digging out details, and

discussing essential elements of design with Web pioneers, including the father of the Web, Tim Berners-Lee, and Mosaic founder Mark Andreessen.

"I was there at the start and we were talking about how to make dynamic Web pages, how to do searches and things like that. Back in those days we didn't even have CGI, which is the world's simplest way of doing that. We had to add code right into the code of our Web server; there was no handy modularity. So we were talking about the best ways to do that, what forms should look like and how to lay out tables. It was really pioneering stuff."

Torkington had some input into the unique identifier tag that HTTP uses to determine whether or not a file has changed. His proposals for compressing data to save disk space and having the server uncompress it for transmission over the Web were interesting, particularly in New Zealand where disk space was like gold, but that wasn't exactly world changing. His most endearing contribution was probably 'the cancel button' in the open dialog box of Mosaic.

Of course being first means others want to know how you did it. Torkington was soon sought after to share his Web development skills with other academics. "I still have nightmares about having to teach academics how to make HTML pages. Because the tools were really primitive, you really had to do the work. We weren't even using Windows 95 at that point." He pulled together everything he knew and created the first Web FAQ, which was published on 6 April 1993 in the Usenet newsgroups. It was hugely popular and was ultimately reprinted in many books. It was his FAQ, and its subsequent updates that taught many people what the Web was about.

So how was it that a university graduate from New Zealand ends up telling the world about the Web? "Well that's the great thing about the Web isn't it, nobody knows you're a dog, and nobody knows you're an undergraduate from New Zealand. It was just about having the initiative to do it at the right time. It's still true on the Internet: the first people into a technology become the gurus and it doesn't matter where they are."

RED LIGHTS AND RED FACES

Just as the Internet was moving beyond the confines of the university and research community, its seamier side, the one represented by alt.sex and related newsgroups and early red-light district web sites, had attracted considerable media coverage and political debate.

There was an attempt to make ISPs responsible for the material being downloaded. Trevor Rogers' Technology and Crimes Reform Bill, tabled in parliament in 1993 while he was still a National MP, would have resulted in anyone proven to have been transmitting 'objectionable material' having their phone line disconnected for up to five years. His private member's bill stated that any communication with foreign web sites or telecommunication services which transmitted objectionable content would also be considered an offence and ISPs would be ordered to cut those services off. After several attempts to have it passed into law, and an outcry from the Internet community, a select committee eventually rejected the bill in 1997, stating that it was "virtually impossible to control material that is brought in from other countries." Even if you could, such a law would have Bill of Rights implications.

Interest in the Internet in New Zealand was growing exponentially. The number of users had gone from hundreds to about 10,000 in a few years. To cope with demand, the speed of the NASA–subsidised Internet satellite connection with the US backbone doubled in July for the third time in three years to 256kbit/sec. Rather than the clumsy PACCOM[22] moniker for the access gateway at Waikato, the term NZGate began to be used. In June and again in August, Simon Lyall's 'Internet Access in New Zealand FAQ' was posted on Usenet to teach beginners about Internet etiquette and navigation.

NASA had been scaling back its funding since the subsidy for the international link was first agreed on, and support for the New Zealand link ceased on 30 April 1994. However Waikato had been thinking ahead. Its controversial volume-charging approach had ensured there was sufficient cash in the coffers to cover increases in bandwidth and other contingencies. "It was a balancing act. We were constantly reducing the price through economies of scale but we had to track this so it eventually covered 100 percent of the costs," said gateway manager John Houlker.

Later in 1994 Waikato's international link to the West Coast of the United States, supplied by AT&T, had an embarrassing outage. Just as the first wave of Internet aficionados were demonstrating the commercial possibilities of Web connectivity at the Computerworld Expo in Auckland, the connection failed. A technician at the AT&T exchange in San Francisco had accidentally knocked out a plug. "It took them four hours to find the circuit designation and another two hours to fix it," recalled Houlker. "I had been looking at putting in a second circuit but AT&T insisted theirs was super reliable and would be much cheaper than us investing with another provider." However, another failure forced Waikato to take a second link into the NASA gateway from Sprint.

Waikato had already taken on far more than it bargained for and was looking to a time when the backbone would be entirely commercially managed. Increased use by businesses and individuals and the arrival of a handful of commercial ISPs suggested t was time to take note of the United States example and a rethink on who would take responsibility for future development of the New Zealand Internet backbone and administer the dot.nz country code and domain name registry (DNS). A series of meetings took place to make those decisions.

"NASA no longer needed us to keep the Internet in New Zealand going. It became a standard product they could pick and chose from 20 different vendors," said Houlker.[23] In parallel it was decided that the University of Waikato should step away from running the international link. Frank March, John Houlker, and others proposed an independent democratic organisation to take over the domain name service.

Jim Higgins recalled one meeting of the Tuia Society early in 1994, when John Houlker turned up and announced he had some serious news: the previous Wednesday the number of registrations of dot.co.nz had exceeded the number of registrations of dot.ac.nz. "Waikato had been running an academic network and the thing had now got away from them. He was concerned about what was going to happen and it was then that the Kawaihiko group began seriously considering how to shift everything over to an Internet society. They didn't want to be running a commercial Internet."

Frank March drew a graph on the whiteboard which illustrated the point. If current trends continued the dot.co.nz commercial registrations were rising so steeply, compared with the other dot.nz registrations, that they would overtake all the rest by May 1994 and then completely dominate the dot.nz space. "That is exactly what happened and that was the basis for the Internet Society of New Zealand (ISOCNZ) being set up in the first place, not so much to run dot.nz but because it was very clear that the local Internet community was no longer going to be restricted to, or dominated by, the science and academic communities. Something was required other than Tuia so that the rest of the community could be involved in how the Internet in New Zealand developed."

Don Hollander, at the time chairman of TUANZ, recalled a new body being discussed at a meeting at Victoria University. He believed running the Internet in New Zealand could easily fit in with his organisation's mandate but that wasn't to be. In November 1994 the Tuia Society advertised a public meeting at the National Library auditorium in Wellington to establish a new public body to manage Internet infrastructure development.

The CRIs no longer seemed interested in providing funding for Tuianet, leaving it with a much-reduced budget, mostly used for covering air fares, and an amount set aside to help fund a new

body to take over its role. Uncertain of the way forward, Tuia had backed away from increasing its membership and from broader responsibilities, concentrating instead on maintaining its core sites until a new organisation could properly represent the interests of users. It was prepared to put up around $10,000 to help establish such a group, which was tentatively referred to as the New Zealand Internet Society.[24]

There was a cost involved in maintaining a DNS, and fees incurred for Internet number assignment, through the Asia-Pacific Network Information Centre (APNIC), which was itself depending on donations (US$10,000–$20,000). The funding situation could not continue indefinitely. Attempts by Waikato and Tuianet to charge for such activities had "provoked hails of protest from the Internet community."[25] Running a new body would require resources, including the ability to advise users, although delegating that consultancy role to providers might reduce the load.

It was suggested the Internet Society of New Zealand (ISOCNZ) become a legal entity supported by membership fees. The new group would claim control of the dot.nz namespace. At the meeting, Colin Jackson, from the government's IT Policy Unit, suggested a clause stating that common resources should be 'uncapturable,' a term that became a byword for all the group was to stand for.

The goals of ISOCNZ would be to "maintain and extend the availability of the Internet in New Zealand and its associated technologies and applications, both as an end in itself, and as means of enabling organisations, professionals and individuals to more effectively collaborate, co-operate, communicate and innovate in their respective fields of interest."

It would start as an unincorporated society and become incorporated as soon as possible.

a) development, maintenance, evolution, and dissemination of standards for the Internet and its inter-networking technologies and applications;
(b) maintenance and evolution of effective administrative processes necessary for operation of the New Zealand Internet;
(c) education and research related to the Internet and inter-networking;
(d) harmonisation of actions and activities at national levels to facilitate the development and availability of the Internet including but not limited to IP and DNS;
(e) collection and dissemination of information related to the Internet and inter-networking, including histories and archives;
(f) liaison with other organisations, New Zealand government authorities, and the general public for co-ordination, collaboration, and education in effecting the above purposes;
(g) to co-operate with the international Internet community and to seek a formal relationship with ISOC;
(h) to represent the common interests of wider NZ Internet community.

A steering group was established and a further public meeting planned at the National Library in Wellington. The question of who should have responsibility for managing the international Internet connection remained. John Houlker had recommended at least two providers so ISPs and businesses could choose who they wanted to connect through.

"There was every reason to believe this technology was leaving the experimental research and development sector and IP was becoming a conventional telecommunications protocol. We knew the private sector would realize this could be good business and that the telcos might want to get involved. We also knew that a large telco with deep pockets could start offering a discounted service and bowl over our cashflow. We were on a fine balance and couldn't survive any kind of competitive battle at all. Running the international gateway only worked when we were the only game in town, so the objective was to get out cleanly while ensuring the Internet community had a good service going forward," said Houlker.

In 1995 the NSFnet backbone was replaced by commercial backbones across the United States. NASA continued to manage the federal gateways with a link into the private networks and the next-generation supercomputer networks. The arrangement with PACCOM community, which Waikato was party to, was expected to come to an end, with traffic moving across from NASA Ames to the proposed 'MAE West' gateway. However Mae's invitation to "come up and see me sometime" was never issued. The gateway wasn't ready so NASA, despite its public non-profit charter, agreed to continue running the New Zealand connection at full commercial rates.

LAB RATS LEFT SPINNING THEIR WHEELS

"Broadband networks are the future superhighways of telecommunications. They will enable video information to be transported on a dial-up basis as easily as ordinary telephone or facsimile messages are sent today," Laurence Zwimpfer, Telecom general manager business futures, Telecom press release, June 1992.

As plans to take advantage of the enormous opportunities allegedly opened up for New Zealand through deregulation, a proposal was put forward early in 1992 to promote the country as a World Communications Laboratory (WCL).

The WCL would showcase New Zealand as a centre of excellence for developing and using broadband connections capable of supporting voice, data, video, and graphics. The idea was fielded by a group of academics, chief among them Waikato University's John Houlker, who wanted New Zealand to become one of the first broadband network economies in the world.

The group had found a willing ally in Dr Ian Forrester, New Zealand's chief scientist, who seemed to be the only person who understood the importance of public-sector decision making in shaping the future environment. He told a gathering of IT&C specialists in Wellington that the world was on the threshold of an information age where information would become a dominant global activity. The Research Computer Network announced in the 1992 budget could become an important component in establishing a broadband communications environment that would attract foreign investors and those involved in global research and development.

Cabinet had asked for reports from Maurice Williamson, Simon Upton, the minister of research science and technology, and Dr Forrester to see how the WCL would fit in with other government initiatives. The gauntlet was thrown down to the private sector to get involved. Forrester's thinking echoed that of former Communications Minister Jonathan Hunt, who back in 1990 believed that the sale of Telecom heralded a bright new era where New Zealand would become a microcosm for development and testing of new products and services, and a potential communications hub of the Pacific Basin.[26]

A staunch supporter of the WCL concept was IT industry representative Brian Eardley-Wilmot, head of Microsoft distributor Brimaur. He insisted that because of its size, deregulated economy, and geographic situation, New Zealand could be one of the first countries in

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the world to meet the challenges of the information age and reposition itself for the future. It was clear broadband communication would be the basis of the next wave of technologies, and New Zealand was in an ideal position for such technology to flourish.

He said it was imperative "a nationwide broadband switchable public access network" was established. Government departments, SOEs, meat industry exporters, retailers, tourism, the legal profession, health, research and development, education, entertainment, and a host of other industries would benefit from such a network. Even Prime Minister Jim Bolger weighed in with his approval for the WCL secretariat.[27]

ROCK AND A HARD PLACE

However three months after he'd put his support behind the WCL Eardley-Wilmot seemed to be caught between his enthusiasm for the new project and his role as president of the Information Technology Association of New Zealand (ITANZ). He announced that ITANZ was stunned the government appeared to be rallying behind such a progressive project when it hadn't even announced an overall information technology policy. ITANZ hadn't been consulted and was concerned the government wasn't taking IT as seriously as it should.

The WCL project was launched on the same day as the ITANZ AGM, and an announcement from president Eardley-Wilmot, that a paper urging the government to take a more co-ordinated approach to the development of IT in New Zealand, was about to be presented to government.[28]

In July 1992 the government had committed $80,000 to the WCL project and Telecom pledged $100,000. In announcing the funding, Telecom's general manager for business futures, Laurence Zwimpfer, said it was "nonsense" that eight government departments had committed the total funding for a period of only six months. It was important that New Zealanders with vision develop uses for emerging telecommunications technologies, he said, and took a sideswipe at telecommunications engineers who spent ten years coming up with narrowband ISDN but forgot to ask users what they wanted from it, resulting in slow uptake. He pointed to Tuianet as a good example of users coming together as a planning forum, and hoped the WCL would create many more such groups.[29]

Zwimpfer said New Zealand's unique regulatory environment could create attractive opportunities for offshore companies to test new developments that had real benefits for New Zealand businesses and potentially every household. He gave every indication Telecom would be looking at other practical ways to help the WCL.

In a press release a month earlier he waxed eloquent on how Telecom was planning for specific technology applications that would enable teachers to access video libraries to let pupils experience everything from astronomy to zoology and empower the health sector to make remote diagnosis of critically ill or injured patients. The huge information-carrying capacity of the new networks would "open up new services and provide new options for the way businesses operate… In the future these new networks will deliver a wide range of video-based services directly into offices… In our homes… wall-sized television screens which double as video phones or even an art mural will become commonplace. Teleshopping, where

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shoppers can see full colour pictures of the goods they are buying will replace today's frustrating and time wasting queues."

Home viewers would get more control over their television. "They will be able to watch the six o'clock news at a time that suits them or even the previous day's news… if something has been missed. If viewers want more details on a particular news item, they will be able to choose from a simple menu and get access to background details or a complete interview. Tomorrow's networks will also deliver fully interactive video-based learning directly into our homes."

Zwimpfer insisted organisations like Telecom must work in partnership with their users to ensure the right services were developed and implemented. "The WCL initiative is a positive step in this direction."[30] The WCL appointed director Jim Higgins who began a round of consulting, meeting with like-minded people, co-ordinating resources, and speaking at every opportunity about the wonderful opportunities everyone seemed so enthusiastic about.

Although he had backing from TVNZ, Clear Communications, and Telecom, by mid-1993 he was still having difficulties trying to get bandwidth increased to work with users who wanted to trial new technologies. A couple of CRIs were keen to trial solutions requiring 155Mbit/sec connectivity over several kilometres. A switch maker had agreed to participate, and one vendor had offered to install a supercomputer at each end. The missing link was a carrier to link it all together. "This is getting down to the nitty-gritty now; the technology is here but getting someone to put in the cable and offer these services just seems to put creases in the carriers' foreheads," said Higgins.

So what was the benefit of having broadband communications introduced for a single test site? "It will be a first for this country and allow us to trial some scientific applications and assess the value to research organisations. If it proves you can achieve productivity gains we can look at extending it," he said. Higgins claimed carriers in New Zealand needed a "kick start" if the country as a whole was to gain some competitive advantage from the current opportunities.[31]

FIRST CITIES APPARITION

Having established a world first by putting WCC information on-line, Richard Naylor began discussions with the high-profile First Cities project in 1992. If it had been followed through the plan would have complemented the WCL goals of turning New Zealand into the ideal environment for global hi-tech innovation and investment. First Cities was supported by Apple Computer, Tandem, US West, Sun Microsystems, and Microsoft. Its mission, should Wellington choose to accept it, was 'to create a significant marketplace for network multimedia information and entertainment products by accelerating the development of a national infrastructure for extending electronic commerce to the home.'

Naylor invited the organisers of First Cities to visit New Zealand once it had an active prototype. Naylor, WCL director Jim Higgins, and Karl Rossiter, who was working with TVNZ and its infrastructure company Broadcast Communications Limited (BCL), worked out the details. However the project, which selected New Zealand ahead of many nations lost impetus, said Naylor,

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when Bill Clinton got elected and Vice President Al Gore began talking about the national information infrastructure. "Everyone rushed off to Washington to lobby for federal funding instead of using their own money. First Cities opted to run a pilot in the US instead of risking investment in New Zealand, so it fell apart," Naylor said.

According to Naylor, Wellington had clearly done well in terms of a First City on several counts. "Al Gore had gone to talk to the Silicon Valley people just after Clinton was elected in December 1992, and I got an email on December 24 from a friend at Apple's Advanced Technology Group thanking me for my Gopher server. He said, 'We just did a small demonstration to Al Gore's chief assistant and to Ron Brown, the US Secretary of Commerce[32], demonstrating advanced interfaces to the Internet and their uses for government using your Gopher server.' At that point we knew we were there at the front, doing some significant stuff."

In the end New Zealand's bold WCL project failed to get the critical mass needed. It seemed everyone had their own agenda; it was nice talking about these futuristic ideas but it wasn't really core business. After an initial round of funding from government, business and carriers, and enthusiastic support from science and research leaders and senior government ministers, the government pulled the plug and two years after its formation the WCL was shut down. New Zealand lost its window of opportunity. Plans for government funding for a research network were also scuttled after the DSIR and the universities engaged in a skirmish over who would run the Internet backbone, just as a joint research deal was about to be signed off.

In retrospect John Houlker, who had sowed the original seed for the WCL, perhaps hoping this might at last be the catalyst the government needed to invest in improving the self-funded research and academic network he now believes the whole concept of the laboratory was flawed. "I used to think that having a lot of fibre up and down the country was a big deal, but in fact, it's irrelevant. What you need to make the whole thing work, is high-speed access to the local loop. But no one was willing to pay for the cost of laying the high-speed links into the sites."[33]

NAMING ISOCNZ

In 1988, after a spell as Unix evangelist with DEC Roger Hicks joined Auckland University as a part-time lecturer in information systems, with a few private consulting jobs on the side. He had seen how successfully the universities were using the Internet for email, FTP, and newsgroup access and worked up a 'high-level' business proposal which he took to Telecom. "I suggested if they got a lot of people interested in the Internet they could sell a lot more bandwidth. I took this six-page proposal to a couple of people I knew and tried to sell the idea of a joint venture but couldn't get anyone to buy into it."[34]

Clear Communications was just establishing itself in competition to Telecom, so he took his proposition along when applying for a job as IT strategist there. He got the job and claimed his proposal was influential in Clear eventually setting up its ClearNet ISP in 1996. At the time Hicks had stepped aside from his involvement as founding chairman of Uniforum but his involvement with Clear saw him step into another voluntary role.

He'd learned of the Tuia Society meeting at the National Library in Wellington and convinced Clear it should have a representative there just in case the Internet began to move into the mainstream. "I swanned around at Clear and got as many people to join as I could. It was like a write-in proxy; anyone who wanted could vote, so I turned up with a big handful of proxy votes and that's how I got on the committee and put in a placeholder for Clear. Then everyone turned around and said I was just what they were looking for: someone who wasn't at university or an academic. They selected me as chairman and at that point I couldn't very well back down now, could I?"

The meeting was an important step in devolving power from the universities into a wider organisational structure that would determine the future of the infrastructure and the way the Internet would be run in New Zealand. Initially a day-long public seminar was planned to bring all interested parties together to formalise this group. In November 1995 the ISOCNZ was officially incorporated.

Ian K. G. Mitchell, the Computer Society's nominee to ISOCNZ, had been working in the late 1980s and early 1990s with Wellington patent lawyer Peter Dengate Thrush, developing intellectual property database software for his law firm, Baldwin Son and Carey. He was elected to the ISOCNZ council, and when the issue of domain names emerged, Mitchell recommended Dengate Thrush, then an IP barrister, provide advice on how should proceed with the complex issues surrounding ownership and management of domain names.

Dengate Thrush was impressed with the proposal for a 'first come, first served' policy for allocating domain names. There was pressure, particularly from the trademark community, for ISOCNZ to set up some kind of examination system prior to registration, with rules preventing the registration of names registered by anyone other than those who held those trademarks or company names. However this could mean registration would take many months and involve the society in permanent dispute resolution.

He advised against ISOCNZ creating a formal dispute resolution service. He had seen how this operated in other registries around the world, particularly at Network Solutions Inc (NSI), the dot.com registry manager, and concluded was uneconomic and unnecessary. Instead, he recommended adopting a position where ISOCNZ would comply promptly with any court orders brought by aggrieved parties.

Dengate Thrush also advised forming a limited liability company to run the dot.nz registry business on a commercial basis, to be wholly owned by the not-for-profit society. The creation of the separate company, known as Domainz, would provide a legal and commercial firewall between the councillors and the operation of the registry. He recommended appointing Gavin Adlam, a local solicitor, to act for the society.

The initial intention of ISOCNZ was to join the international Internet Society (ISOC) but not long after its formation there was a phone call from the executive director of the international body complaining about the name the New Zealand body had chosen. As far as he was concerned it wasn't an Internet society unless it was a member of ISOC. In 1996 when Roger Hicks turned up at an Asia-Pacific telecommunications conference in Hawaii he found himself walking a fine line between his role as chairman of the newly formed ISOCNZ, and being part of the strategic planning team at Clear Communications. He was confronted by Vint Cerf, was chairman of ISOC and a senior vice president of MCI Communications, one of Clear's owners. "Our discussion raised a few eyebrows. He told me he wasn't happy about the name and I said, 'Well, tough shit. You haven't got any say over the name we've chosen in New Zealand.'"

PICKING UP THE PIECES

Within a year of its formation, the management of the dot.nz name space was transferred to ISOCNZ, along with the management of about 2000 domain names in the dot.nz register. In September 1996 some real challenges arose. One was a major law suit against an opportunist, who had registered a

range of high-profile company brand names. When Sanyo, Cadbury, Xerox, and Fuji began realising the potential of the Internet and sought to register their domains they realised they'd been trumped. They hired lawyer Clive Elliott to get those names back from the Domain Name Company Ltd (DNC) and in researching who was responsible for this travesty, the brand-new ISOCNZ found itself implicated. Initially it looked as if ISOCNZ would be a main defendant because it had allowed DNC to register cadbury.co.nz, which resulted in DNC then attempting to sell Cadbury its own name to for $10,000.

A letter from Clive Elliott and Alex McDonald of lawyers Baldwin Son and Carey to ISOCNZ lawyers Rudd Watts & Stone on 18 September 1996 made the statement of claim and application for an interim injunction, although neither ISOCNZ nor Domainz were named as parties in the proceedings. Fortunately the tide had turned somewhat and the big companies, while understanding the precarious position ISOCNZ was in, were keen to work things out. There was still a high risk, though, that it may need to call ISOCNZ as defendant.

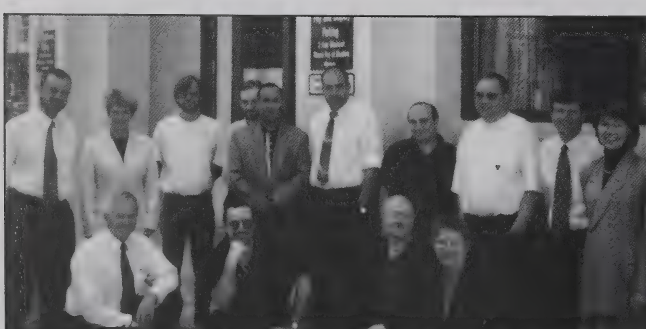
We understand that ISOCNZ does not support the actions taken by the defendants. Accordingly any statement confirming and indeed asserting that the actions taken by defendants are likely to be contrary to the interests of and harmful to the Internet community would certainly assist... It would be of assistance if your client (ISOCNZ) could say that even though it does not see its role as an adjudicator, it was misled by the defendants' representations and regards the defendants' actions as questionable and an abuse of the system.[35]

The matter went to court on 27 September before the Honourable Justice Morris, who ordered that the defendants, the Domain Name Company[36] of New Zealand and David John-Paul Cameron Ward as second defendant, and Patrick Clement Robinson as third defendant, be restrained from directly or indirectly using the words Cadbury, Sanyo or Xerox or the related domain names or any similar name which was likely to "dilute the value of the plaintiffs' trade name or trademark in connection with advertising, operation or maintenance of any Internet site in New Zealand."

Justice Morris directed the defendants to take affirmative steps to either cancel the domain names or reassign them to the respective plaintiffs, and forthwith remove any link or referral notice whereby Internet users could access the first defendant web site by use of the domain names. The court directed the ISOCNZ to immediately transfer the domain names to the respective plaintiffs.

ISOCNZ was pleased with the outcome because its policy of not taking part in legal proceedings had been upheld. The legal community, however, was disappointed there had been no judgement which might have clarified the interaction between domain names and trademarks. That day in court was yet to come.

Back row – Colin Jackson, Jennifer Northover, Mark Davies, Don Stokes, Prashanta Mukherjee, Keith Davidson, David Farrar, Peter Mott, Richard Bourne, Liz Dengate Thrush. Front row – Jim Higgins, Mark Harris, Don Hollander, Sue Leader.
Photo: InternetNZ Archive.



Meanwhile the ISOC had been placing increasing pressure on ISOCNZ, questioning why it hadn't joined as an affiliate member. The issue was raised again at an INET (International Networking) conference in 1996. "The reason was, in the chapter rules of ISOC it said, 'You won't make political moves without the approval of the ISOC board and you won't take commercial or financial risks.' Clearly if we were going with the DNS dot. nz we were going to be doing both of those things," Roger Hicks said.

Communications Minister Maurice Williamson with InternetNZ committee member and Internet code of compliance advocate Roger de Salis and executive director Sue Leader, circa 2001.
InternetNZ Archives.

"We didn't want to be restricted from making commercial statements about our marketplace or prevented from taking legal and financial risks. ISOC said other groups were doing all of these things already, so it didn't really matter. 'Just join in and we'll all be happy campers.' However the committee and council in New Zealand were of the view that if they signed something, that it wasn't right to ignore what they were signing and say it didn't matter. That's why we never joined ISOC."

Peter Dengate Thrush provided advice on ownership and management of domain names.
InternetNZ collection.

There were long discussions about fees and the way these were paid to the US-based governing body, which put the local organisation on the back foot. "We had carved our own path from the beginning, even with our domain name rules, which I was responsible for setting up when Waikato University, handed over the domain system to us. We've always had an independent approach which resulted in a lot of accolades particularly when we decided we were a listing service and we would allow any name to be listed on a first come first served basis. Those principles were quite surprising for many people," said Hicks.

The Internet in New Zealand had a new advocate watching its back, but the territory was still like the ancient wild west, and ISOCNZ had to work hard to establish its claim. The group was not timid or easily warned off by big international bodies who were themselves still trying to scope out how to deal with the inexorable march of the Internet. A strong watch was being kept on legal and regulatory issues, and the impact of the commercial market as ISPs became an important part of the growing Internet community.

6

Craving for connection

Dawn of the dial-up community

The new electronic interdependence recreates the world in the image of a global village.
Marshall McLuhan, *The Gutenberg Galaxy*, 1962

While the universities were playing around with computer gateways, early Commodore, Atari, Amstrad, PC, and Macintosh users in New Zealand and around the world, were creating their own dial-in communities to access games and software or share opinions and information.

The first electronic bulletin boards (BBS) appeared in the late 1970s. They were essentially discussion platforms or notice boards for the technically literate, usually set up by computer clubs or electronics hobbyists. They predated the Internet using conferencing or chat room-style software so people could, through dialling a specific phone number during certain hours, read or respond to messages or join discussion groups.

Early membership was often invitation only, geared around the interests of one or two individuals. Topics of interest ranged wildly from software problems and cracking code to gaming shortcuts or talking about the latest movies, music, or technological breakthroughs. Other groups were made up sci-fi fans, budding astronomers, home electronics enthusiasts, genealogy junkies, greenies, or political activists.

Enthusiasts would post anything that might be of interest to other members, often gaining access to wider resources such as Usenet newsgroups through their contacts at universities. Many BBS hosts, or sysops (system operators) expanded their equipment and services to the point where they began charging for access. The bulletin board remained the main on-line connection for early computing and communications enthusiasts until the early 1990s.

In New Zealand BBS grew from a handful to more than 100 dial-up outposts, including The Tower, The Cave, Springboard, Equinox, Crystal Lights, The Labyrinth, The Asylum, The Bathtub, Enigma, Mousehole, Purgatory, The Toolshed, Mirth Control, Status, Actrix, Kappa Crucis, Pinnacle, Demi Monde, Nacjack (neurological activity controller), and Malleus Maleficarum.

At the peak of BBS popularity around 1990–1992, there were an estimated 150,000 computers in New Zealand homes, more than 100 BBS and thousands of subscribers, many logging into multiple

discussion boards in search of information and stimulation. Lists of BBS were regularly published in local computer magazines including *Bits & Bytes* to help people find their area of interest.

BBS communities thrived in Auckland, Dunedin, Christchurch, Wellington, and Hamilton. The Wellington community grew from the city council's free-access CityNet. Otago University had a whole machine room named around *Lord of the Rings* (LOTR) characters that hosted BBS, and Waikato University had the legendary Simon Travaglia, who ran his own BBS and created the BOFH (bastard operator from hell)[1] stories . He is alleged to have overclocked his 386 so much that it caught fire. He took a photo of it and posted it on-line.

FEEDING THE ON-LINE FRENZY

Richard Vowles' pioneering BBS were known for their free newsfeeds, macabre names, and innovative software hacks that broke down network boundaries. He launched his first bulletin board in 1983 when he was 14 years old, using an Amstrad computer and a 300k modem. He had little interest in the hardware or BBS content; his focus was on the software. He wrote his BBS on the Amstrad in Assembly language and even hacked the BIOS (basic input/output system) to get more data on a floppy disk. An early floppy disk had a capacity of 400Kb but once Vowles had completed his hack of the available sectors he claimed it would hold 600–700Kb.

His entry-level efforts soon became famous under the name Nacjack, taken from a role-playing game (RPG) called Cyberpunk. "This was the reengineering of my BBS from Amstrad to PC and DOS to Unix, which was later rewritten again in C to become Malleus Maleficarum, a host machine that lived in a cupboard under the stairs." Malleus Maleficarum[2] was named after the Catholic Church 'witch hunters handbook' published in 1486 by two official German Dominican inquisitors, which Vowles claimed was responsible for more deaths of innocent people than any other book but the Bible in the Middle Ages. "It was just a cool name," he said.

Vowles enjoyed the challenge of building gateways between different networks and making friends with common interests. The core technology used by most BBS was Fidonet,[3] which was a technology as well as a network. As the more mainstream chat rooms and message boards filled with people discussing genealogy and gardening, the younger, more technically oriented geeks exited the 'old persons' network and built their own outposts. They preferred to operate at the fringe where more edgy and even subversive topics might be discussed – how to hack into certain programs, the merits of different BBS software and technology trends. That's where another Vowles BBS, Demi Monde, gained popularity. That was also where you went to find out where the parties were.

Some of those parties were run by Bernadette Mooney, who became a kind of mother of the Auckland BBS community. She was one of the few women involved, and haunted almost every hip site, running appropriate parties at various times. Most of those who turned up were 15- to16-year-olds glad to be among peers; those who could hold their own when it came to discussing everything from code to gaming strategy or what was happening in the on-line community.

Mooney had taken an interest in the mid-1980s, when one of her son's school friends loaned her family a modem. She soon bought her own and acquired software to originate her own presence. She had been made redundant from a role at the Share Registry, was studying for an arts degree at Auckland University, taking on part-time secretarial work, and had two intermediate school age children. "I remember chatting to a sysop one night, and he had to excuse himself as he had a Stage II calculus lecture at 10am next day. He was rather surprised when I told him I had a Stage III metaphysics paper at 9 a.m. Perhaps he thought I was a teenager."

Mooney's site was Pinnacle Club BBS, a name suggested by the author of the Canadian software she used, which had the ability to run 'doors,' or separate programs for members. The most popular

was the Pyroto Mountain Gaming System, a kind of RPG with a strong element of general knowledge and trivia questions, which attracted a cult following. "People used to set their alarms and log on in the middle of the night to advance a level or communicate with others in the game, as there were a strict number of hours between log-ins set by the system."

The BBS community was made up mostly of male science and engineering university students, some high school students, and a few memorable older people. "One very elderly man lived outside Auckland, spoke something like ten different languages, was interested in all kinds of things, and used the BBS for email and Usenet news. There were also a couple of women of my own generation," said Mooney.

Dawn Scotting, 'a retired housewife of Avondale,' had run her own BBS since the mid-1980s. It was called Pandora's Box and hosted on her trusty Atari XE computer with two external floppy disk drives and a 1200 baud modem. "I stuck to that computer like glue for years, even when all around me were now using PCs but of course I eventually had to give in." These days her many interests, including quilting, book collecting, and cooking, have been transferred to the Web but her main on-line focus was genealogy. Scotting, who had about 100 regular subscribers, was allegedly the first woman sysop in New Zealand to run a BBS. *Reader's Digest* included her in an article on how New Zealanders were adapting to home computing.

Dawn Scotting originally bought her computer for her six children, then got hooked herself and is now on the committee of her Atari user group. "It's become my main hobby, she says. "Every day I spend hours writing letters on my own computer related letterhead or taking care of my bulletin board…It's fun…We swap and play computer games and try to solve each other's computer problems," says Scotting. For Auckland paraplegic Mike Pownail, subscribing to a bulletin board is like going visiting. "You leave a message, someone replies, then you have a conversation through your keyboard." Modems can also be used to link into special information services like Myriad Videotex, operating out of Trentham. This provides information such as the latest sports and lotto results, foreign exchange rates and the Barclay index, bank investment and mortgage rates and weather reports…" I suppose I should spend more time doing the housework but – let's face it – housework's boring. Computers aren't," says Scotting.[4]

Bernadette Mooney believes those who ran BBS were mostly programming types. "Their main ambition was to have a faster mail system and a better database than anyone else. There were those who wanted a pulpit for their usually most eloquent opinions, others enjoyed the power that sysadmins have always had, but many were in it purely for the communication involved. It was a way of communicating with others, especially if unable for whatever reason to get out and about freely."

There were not many occasions to meet and talk in person, and most members of the community had other interests. "They were, after all, a fairly bright and intelligent set of people, and as with any community, a pretty varied group of personalities with wide-ranging interests." Moody was often involved in on-line chats with the young men who ran these systems and carried on long email conversations with others. In the mid-1980s she convened a meeting of BBS sysops. There were only about half a dozen in Auckland then, and after that various people used to drop in on a Sunday afternoon, which was nice.

"There were a few BBQs at which many of the attendees were BBS people, but nothing really organised. David Dix of kcbbs.gen.nz asked that I organised a couple of dinners which were quite well attended with guests from Wellington there, too." Those who turned out might have included respected security specialist Peter Gutmann, a couple of the gamers who had used the Pinnacle BBS system and later went off to work for netscape and others who started up ISPs and telecommunications companies.

During her early experiences of Internet relay chat (IRC) Mooney could out-type the 300 baud limitations, having to wait for the screen refresh to catch up with her outpourings. However she found she spent too much idle time chatting away with unknown others. As real life intruded and study took a backseat, she worked from home, designing and maintaining databases and keeping mailing lists. In 1992 she had a heart attack which required bypass surgery and the BBS ran itself for a few years.

She closed her BBS in 1994 and only kept it going that long because people with different machines including BBC, Amiga, and Commodores, had nowhere else to connect. At the end it was running on a single phone line and had only a dozen or less users accessing email. "I waited until they all had somewhere to go before relinquishing the phone line."

That year Mooney started work as a secretary at Auckland University, then moved to the IT helpdesk, and on to work with 'the network guys,' in what was still a mostly male dominated environment. She said the advent of the Internet made BBS redundant. "The ability to exchange email over a much greater geographic area was, well, magic. Some time in the mid-90s, I was working in Symonds Street in the city, and my daughter worked in the building next door. It seemed really strange that email from her building went to somewhere in the States before I received it, but the speed was amazing to me at that time."

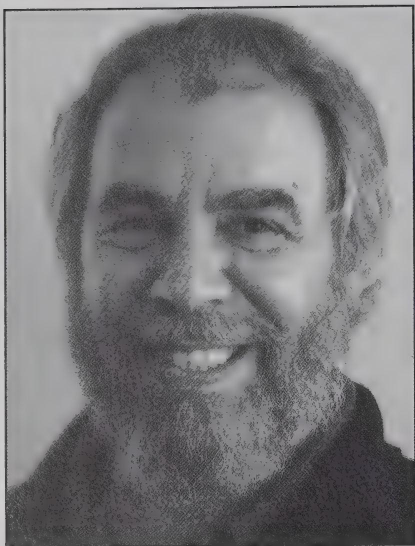
OUR FATHER WHO ART IN CYBERSPACE

Originally from the United States Father Jack Witbrock lived in Rangiora and was in charge of the Orthodox mission at Ashley. He used the Internet to keep in touch with his son, who was studying at Carnegie Melon University for a PhD in artificial intelligence, and with his daughter and son-in-law in England. He also corresponded on the Internet with Tony Raiziz, a former Ashley congregation member living in Switzerland. With the support of the Labour Department, Father Whitbrock ran computer classes in Rangiora for unemployed people. Most South Island tertiary institutions were linked to the Internet. Members of the public could access the Internet for a fee to cover costs through the Christchurch bulletin board Equinox run by Geoff McLaughlan.[5]

FETCH FIDO, GOOD DOG!

Once the Internet came onto the horizon there was a growing desire for BBS users to access newsgroups and other resources. Richard Vowles had a couple of friends working at the DSIR who quietly shared their Internet access with him and he passed on those benefits. He was given a direct link into the DSIR system and in turn provided a gateway service to a hundred or so users on his own system and about 35 other BBS. "I was the first person in New Zealand to write software that provided a link for Fidonet people to cross the chasm into the Internet to access newsgroups."

When the volume started to get out of control a fast modem was needed. "I ended up pulling data down on one line and running the BBS on the other line." Vowles wrote text-based games so people could interact over their phone lines, including specific games for Bruce Simpson[6] who was running his own BBS. When David Dix came along he began providing direct access to email. "I was on a different level where I wrote my own access. His was more focused around



John Vorstemans, co-founder of the Actrix network in Wellington and founding member of InternetNZ.

Usenet and specifically an Internet approach. I was more interested in the BBS culture. I gave up when I heard Telecom were getting into the business," said Vowles.

Operating from home he paid for the technology and any costs relating to the Internet feed from his own pocket. His parents covered the cost of the phone lines. At Auckland University he gained a double degree in Computer Science and Information Systems and ended up working part-time in the computer department. "One of the perks, because the pay was such crap money, was they allowed me to have a server next to my desk with a phone line attached. My home line dialled into that to get directly into that machine and I used it to connect directly to the Internet."

He never turned his BBS into a commercial service, and by the time the market was heading that way he called it quits. In 2007 Vowles was running his own software development tools company and working as a product evangelist, running seminars, and teaching people how to use those tools, many of them Internet related. He finds computer or Internet role-playing games extremely antisocial. "I hate them and rail against them at every opportunity." Tabletop role-playing games, however, were a different story. He'd been involved with those since he was ten years old and finds them challenging and social.

John Vorstermans began exploring computing around 1984. He had a fascination with communications, particularly for sharing his early activism on green issues. His partner Paul Gillingwater was involved in the IT industry and had become aware of Usenet newsgroups while at Victoria University. Together they established Springboard, a free-access bulletin board aimed at environmental awareness, global warming, and related issues.

"There was an awareness about the changing climate, and scientists were talking about rising sea levels, possible ice ages and that sort of thing." Vorstermans hosted Springboard at his Wellington home, where he had two networked 80286 computers and three dial-up modems with a connection into Fidonet, essentially a distributed conferencing system for hobbyists, similar to Usenet.

Usenet was one of the original Internet applications that allowed people to post messages that were copied to subscribers and available to read when they next dialled in. In the early stages you had to read everything through the bulleting board interface. Subscribers would typically spend half an hour to an hour on-line, with probably about 80 people viewing at a time through different access providers.

As the Internet gained prominence Vorstermans and Gillingwater were keen to evolve Springboard and get more people on-line. The initial motivation was to make Usenet available to the public. "Many people used to having access it at university lost that access when they left so we began to offer that service so people could read it on-line or download it to their computers." Springboard quickly evolved into ISP Actrix; a play on words linking 'action' and 'Unix,' the operating system the Internet was first built on.

ABORTED BBS SPRINGBOARD

Don Stokes set up his first bulletin board in 1985 as a student at Waikato University, using his first year comp.sci account. It was largely a social thing among first year "lab low-lifes," according to Stokes. Once he got his own flat in Auckland the first thing that went on the phone line was a home-made 300 baud modem connected to a System 80 (a Tandy TRS-80[7] clone) with three floppy drives, to help a friend start a bulletin board. His role was largely code maintenance, "painful when done remotely at 300bps."

In April 1986 Stokes began working with Datacom as a programmer. "There was huge demand for programmers, and just about anybody vaguely capable of stringing two thoughts together could get a job. Mostly, we dealt with accounting systems. I had a bit more of a technical bent than most others on staff, so got to deal with funny tape formats, dial-up and X.25 comms for terminals, and file transfer, remote data capture for the payroll system, Videotex, interactive voice response systems and other oddball stuff."

By this time he had upgraded to a Commodore Amiga 1000, the desktop machine of the time, from the first commercial shipment into the country. "I spent far more money on it than I should have (around $5000)." From early 1987, now with his own modem, he began trawling the various BBS as well as having remote access to Datacom's machines.

At Datacom he'd gained first-hand experience of the Post Office Pacnet service and other networking technologies used in the business community. In April 1988 in the aftermath of the stockmarket crash, he headed to Wellington to work at the Government Printing Office (GPO). Three weeks later the new minister of SOEs, Richard Prebble, announced it was to be sold as part of the government's privatisation plans.

The GPO was a large user of DEC minicomputers, and the director of information services, Dr Ian Calhaem, who was heavily involved in the Digital Equipment Computer Users Society (DECUS), asked Stokes to set up a bulletin board for members. As a former DSIR member, he organised a dial-up connection through the DSIR Applied Mathematics Division. However the scheme never had organisational support, largely because of management changes and the fact that the computer bureau of the GPO moved away from Dr Calhaem's control. "By the time DECUS gave up on Dr Calhaem's scheme, we had news and mail running. It wasn't costing us anything and we saw no reason to turn it off."

The 2.4kbit/sec dial-up connection used a protocol called Phone Net. "I'd say it was the worst protocol I'd ever seen, with the possible exception of IBM 2780 over a half duplex international dial-up. It was a dreadfully inefficient but still enough to shift email and Usenet news," said Stokes, who went on to help found Victoria University ISP NetLink.

REACHING FOR THE STARS

While many of the early bulletin board operators operated from pocket money and bare essentials for dial-up access, David Dix had the good fortune to be well placed within the IT industry, enabling him to dedicate resources to his hobbies and help others pursue theirs.

In the 1980s Dix worked for Paxus, reselling computer systems, and as a director of Phoenix Systems, which distributed the Santa Cruz Operation (SCO) Unix software, and developed banking and Xenix-based multi-user accounting software. He was also director of the Auckland Observatory and ran the Auckland Observatory Computer Information System (AOCIS) bulletin board.

Located at the Observatory, AOCIS was based on a Sperry Micro IT 286 8MHz system with two phone lines and 1200 baud modems. It began operation in October 1986. The NZMC BBS, hosted on a Samsung 10MHz 286 AT-style computer with an 80Mb disk drive, was a development

system with a files archive. It was located at the club chairman's house in Mt Wellington, Auckland, with two phone lines and 1200 and 2400 baud modems. Both systems ran the SCO Xenix operating system.

"The observatory research group found out the Ritter Observatory in Toledo had this new thing called UUCP, where they shared information about astronomy, so we arranged telephone calls to pick up a feed of the Science Astral newsgroup, which in those days was one of only five available in the formative days of Newsnet news," said Dix. Newsnet grew rapidly, with new forums added in rapid succession. In about 1989 Victoria University established a 9.6kbit/sec dial-up link into the University of Sydney, bringing in 212 newsgroups. Three weeks of news used about 60Mb on a hard disk.

Meanwhile an entrepreneurial group of students at Auckland University – Paul Kendall, Robert van Hartog, Tim Hammet, and Martin Keely – were also keen to access this feed and created their own company called Mercury, from an office in Epsom. They connected to Victoria University and offered newsfeeds to a range of BBS. With Mercury now acting as an intermediary, Dix and the team at the Auckland Observatory saved themselves the cost of long international phone calls.

At the same time the New Zealand Microcomputer Club (NZMC) established the Unix Users Group, which had its own host machine and BBS. As the systems grew in popularity and the administration load increased, it was decided to offer the hardware, phone lines, and other resources to an existing BBS, as long as users could have continued access. Although several operators expressed interest they hadn't followed through by November 1989. At that point David Dix decided to create Kappa Crucis[8] Unix Bulletin Board System (KCBBS) by combining the AOCIS and NZMC systems on a 386, 25MHz PC with 108Mb disk, 8Mb RAM, and three 2400 baud modems, located in West Auckland. The operating system provided multi-user access.

Over a period of four months, software was developed to deliver all the services required on a SCO Xenix system. KCBBS was born on 1 April 1990 with the first multi-user dial-up system in Auckland. It used a bulletin board manager program, closely based on the Delphi BBS operated by Peter Belt. And it was free.

KCBBS expanded throughout 1990, with a hardware upgrade, more disc space, and extra modems. There were 489 users registered; 147 connected every day and 367 connected at least every three days. By June 1990 Mercury (mercury.gen.nz) was providing email access and 386 newsgroups with a full newsfeed, amounting to 9-12Mb of messages. With the new services and the addition of news and email readers, a $10 deposit was requested to help cover email bills. In November 1990 Fidonet was installed on KCBBS, with a connection made to the local Fidonet hub system for news and mail services. Fidonet consisted of 62 mostly local newsgroups. By December 1990 a 630Mb drive was added and the PC upgraded to a 33MHz 386DX with 16Mb of RAM.

In 1991 KCBBS's free access bulletin board system featured as part of the NZMC stand at the Bits & Bytes Computer Show. Over the next year KCBBS acquired two 486 PCs including a dedicated news server, which was now handling 689 newsgroups with an average 30Mb to 40Mb of news each day. In January 1992 Auckland University took over the Usenet feed from the DSIR in Auckland, and it expanded to 1200 newsgroups with a daily volume of 40Mb. In August Mercury closed and the majority of its UUCP feed sites moved to KCBBS.

Around 1992 the FTP protocol began to change the way people accessed information. They could log in to different databases and archive sites and simply download information to their own computers, including graphics files, as binary code. As FTP become increasingly popular, so did the requirement for faster access and more capable machines that could handle the growing numbers on-line. Dix rapidly diversified, establishing a lucrative business helping other people set up BBS systems. As the Internet came more into focus he provided equipment and access to early Internet providers.

GATEWAY TO BIGGER THINGS

In 1988, on returning from Seoul where he covered the Olympics for the *Auckland Star* newspaper, Chris Miller started to unpack the load of boxes that a courier had delivered to his Devonport garage. Miller, who ran the Amstrad BBS funded by Amstrad Computers, considers himself one of the pioneers of Fidonet in New Zealand. He already had two 28.8kbit/sec modems and now Amstrad had supplied him with a couple of PCs, saying it would cover the costs of the phone line. "It was all done on a voluntary basis initially, just for fun," he said.

Terry Bowden was running the IBM Bulletin Board, which became the mail gateway into the IBM Internet system. "We used the IBM tie lines between Auckland and Christchurch to pick up what was then called Echo Mail and Fido Mail. It was the equivalent of email but it used to take 24 hours to shift. My system became a gateway for other bulletin boards to call into to swap their mail."

Over about 18 months the Amstrad BBS became one of the big mail hubs in Auckland, with about 50 other BBS connecting every night picking up their mail and swapping files through the direct IBM link. The feed from IBM came in from Sydney to Christchurch then on to Miller through the IBM BBS. "I remember toll calls were really expensive and the modems we were dealing with were very slow so I bought a Telebit Trailblazer which took advantage of Telecom's multiplexing. I got sponsorship for a Sydney-to-Auckland link with another Trailblazer and started bringing in mail direct to Auckland."

The Trailblazers were about $5000 each but merged two channels on the telephone line across the Tasman and sped up the connection considerably. "Telecom later caught on to what we were doing and started shutting it down but we got about a year's use before that." Then Amstrad started to reel from the cost of the lines and the traffic the BBS was generating and bailed out at that point sponsorship was taken up by the New Zealand Micro Computer Club and Miller's system underwent a name change to NZMC Gateway (New Zealand Micro Computer Gateway). That's where he came into contact with another NZMC club member, David Dix, who was running his own BBS and looking after the Observatory BBS. Another member, Selwyn Arrow, ran New Zealand Micro Maxi, a stand-alone BBS for club members. "My system became the feed system; it was the first in the country to handle multiple lines under IBM's OS/2 operating system running on a DOS box. We even beat IBM to the punch with OS/2. There was just a bit of shagging around but we finally got there. It was all pioneering stuff," said Miller.

LOOKING FOR STATUS

Systems administrator Craig Whitmore was dialling in to various bulletin boards to gain technical knowledge and play text-based chess and multiplayer games from the age of 14. He'd use his Commodore 64 machine and a 1200 baud modem to navigate around the scene and quickly became part of the emerging geek culture.

When he started checking out what was available in the late '80s there were about 60 BBS services in the country. "You could send and receive electronic messages using Fidonet if you knew the address of someone either locally or internationally. After a series of hops from one BBS to the next it might get to its destination in a week. It was a horrible way of doing things but it worked," said Whitmore.

For a small subscription fee users could go on-line any time they liked but he claimed the bulk of activity then was little different from today; downloading pirated games and software or 'horrible quality' porn. Downloading a game, which would fill a floppy disk, could take four to five hours. Whitmore went to Auckland University in 1991 and gained a bachelor of science in computing. Access to on-line services such as Newsnet and email was a little faster but the cost was still high, so student access was limited.

His first role as a systems administrator was with Jon Clarke, who founded Status BBS in his garage in Parnell purely as a hobby. Clarke was an IT consultant with Hong Kong Bank by day, leaving Whitmore to manage and maintain his two 386 PC and five-modem system, which served about 50 customers. Initially Status was the Atari Bulletin Board with a newsfeed taken from David Dix's KCBBS. Eventually it had a direct connection to Auckland University, where it would dial up every hour or so to download email.

"If you knew someone you got invited to log in. That's how it was in those days. A couple of years later we got proper TCP/IP access and a real-time connection to the Internet and the number of customers grew quickly," Whitmore said. That's when he and Clarke moved premises, added equipment, brought on new staff, and changed the company name to the Internet Company of New Zealand (Iconz).

PIONEERING ISPS

While bulletin boards were the building blocks of the early public access networks, once services matured they relied increasingly on university gateways to get them deeper into Internet territory. Much of the early technology and know-how for the next generation of services came from do-it-yourself bulletin board administrators, university computer centre or computer science departments and the scientific research community. The term ISP was unknown; the early players simply saw themselves as selling public access Internet.

The first Internet Service Providers (ISPs) were universities and polytechnics, principally motivated by the need to provide access for staff and students through on campus infrastructure, including Taranaki Polytech, Canterbury University, Victoria University, Waiariki Polytech, and Wanganui Polytech. Costs were typically covered by the information technology (IT) infrastructure of the institution and the service managed by the campus IT staff. To recover additional costs though some used excess capacity to extend services into their local communities. Victoria University in Wellington led the way for the cost recovery model and encouraged others to provide access to those outside campus.[9]

ISP pioneers were a tight community. Most shared applications, fixes, and workarounds, and as they grew out of their old equipment they often on-sold computers, modems, modem servers, and cards to start up operations. From the late 1980s Internet access had been available to some businesses and bulletin boards through leased lines into university gateways. However the commercial evolution of public Internet with fee-paying subscribers accessing Usenet newsgroups and email didn't really get underway until 1992. Michael Newbery of Victoria University kept 'a short catechism' on the Internet:

Usenet news is a service found on the Internet but not restricted to it. It can be thought of as a sort of global bulletin board, with discussion groups organised into several thousand 'newsgroups' covering nearly every possible interest, from comp.dcom.lans.ethernet to rec.sport.cricket. As an example, for the month of May, 1993, there were over 600,000 articles posted to the approximately 2200 newsgroups currently received in New Zealand, or about 43Mb every day! The quality of the information on Usenet is variable, to say the least, but in some areas the information is so valuable as to constitute an organisation's main justification for network access. Although some people mistakenly refer to being on 'the Usenet network,' Usenet is not a network but a service. Within New Zealand, Usenet is administered by the NewZnet project.[10]

In 1993, when the Waikato international connection to the United States was beefed up from an overloaded undersea cable to Hawaii to a 64kbit/sec satellite connection to the NASA Ames Research Centre in California, the trickle of local and international data turned to a steady stream. Anyone who'd heard the information society was just around the corner wanted to know what all the fuss was about. According to Network Wizards, 1193 New Zealanders were connected to the Internet in 1991, and within two years there were between 10,000 and 15,000 – one of the fastest growth spurts in the world.

Reports from Net Wizards and the Ministry of Commerce in 1994 showed continued growth. It was hard to get exact data, with different reports using different methodologies, but one thing was certain: it looked like a hockey stick on any graph.

VICTORIA, QUEEN OF THE ISPS

Victoria University's Computer Science Department[11] had begun making serious but unintentional inroads into the commercial market from 1986 when it first began to supply access to email and newsgroups which it acquired via dial-up connections to the United States and Australia.

A posting by Duncan McEwan[12] on the net.news.newsite newsgroup on 10 October 1986 explained that news articles via an ACSnet link to Melbourne and mail via UUCP in Calgary were exchanged daily.

> *"This will increase once some X.25 problems have been ironed out...For now, we pass mail on at no charge, but once we get established will want to recover our communications costs (we are not worried about CPU usage, disk space, administration etc). Because of the inconvenience of collecting small bills from overseas, we will charge the user/site in New Zealand for both incoming and outgoing mail." Regarding the "willingness (or lack thereof) to connect to new sites that want to join Usenet" it was stated: "Currently we are the only site in New Zealand receiving netnews. We hope to encourage other NZ sites to join. Sites will be able to use X.25 or 1200bps dialup to connect to us, preferably outside working hours. We are willing to call, or be called."*

The email and Usenet news was downloaded using the UUCP protocol and batch supplied to bulletin boards and other local sites. Once a charging regime was established it was at a flat rate for news and a kilobyte fee for email. From 1989 Victoria University had established its own full connection to the Internet backbone via the Waikato gateway and was allowing other agencies to connect to it through leased lines if they covered costs.

Because of its pioneering efforts in the field Victoria's Computer Science Department was asked by the other universities to manage Usenet news on their behalf. To oversee that responsibility it formed the NewZnet Support group, which comprised Mark Davies, Bernd Gill, and Andy Linton. The group was, however, often challenged or criticised for its charging regime by those who believed NewZnet had some wider authority, and that resources should be more widely distributed than they were. This resulted in some terse postings on the NewZnet site. Andy Linton responded on 27 October 1992:

> *We have been charged by the other universities with the task of bringing in and redistributing Usenet News. We do this by offering a news feed to sites for a quarterly subscription charge of $225 + GST. We have negotiated a rate with Kawaihiko for internal NZ news traffic and with Tuia for trans-Pacific news traffic to pay for our use of the NZ Internet.*

We also provide email services to a number of sites who connect directly to our news hub, st-james.comp.vuw.ac.nz. This machine has the UUCP name, vuwcomp.

*We charge those sites for email at $20/megabyte + GST if they have a news feed and at $25/megabyte + GST if they don't have a news feed. If you don't connect directly to us then you won't get a bill from us for *email* and you aren't one of our email customers.*

We don't charge anybody else for mail nor do we set any rates for email or any other form of network traffic for any other site. We have no intention of getting into a discussion about how other sites can cut their costs. We've got enough work to do. If they want to negotiate with Kawaihiko and/or Tuia then that's up to them. Similarly if they want to set up dial-up or leased links to the USA or Australia.

Another department at Victoria was being equally innovative. The Computing Services Centre (CSC), directed by Frank March, with core staff members Michael Newbery and Don Stokes, operated the off-campus permanent network links. They had taken quite literally a university policy of "fostering links with the community," interpreting this to mean that if another agency was prepared to pay its own way to get Internet access, CSC would gladly connect them.

In early 1992 the Waikato 64kbit/sec international satellite link to California onto the Internet backbone was being paid for directly by NASA and the universities directly, rather than on a volume charged basis. Victoria itself was using an enormous amount of the bandwidth and along with it went the third-party traffic. "CSC, compared to the other university computer centres had very liberal policies about Internet use. Basically departments were expected to be reasonable, and while we did track usage, we didn't feel that we had any business telling academic departments what did or didn't constitute legitimate research use. Consequently VUW's traffic levels were somewhat higher than the other universities," recalled operations manager Don Stokes.

Meanwhile CSC's own costs were spiralling out of control through burgeoning internal and external demands and the equipment being used wasn't exactly leading edge. "Our PC routers, essentially large PCs surplus to the requirements of the student labs, were taking up a lot of space. They had become unreliable and there was a desire to improve the campus dial-up facility. A Cisco 516CS terminal server would achieve this, but it was immediately pointed out that we had no budget for this." Stokes said a decision was made to hold a garage sale.

"We didn't feel like waiting until the next year's funding became available, so I pointed out the huge pile of junk, including PCs in the labs which had moved to using Macintosh computers." The proceeds enabled CSC to purchase a Cisco 516CS terminal server and a few other essential items. "I think that was the first time we spent money explicitly for third-party traffic." The increased capabilities saw its traffic creep up to one Gb a month, then double regularly on a monthly basis.[13]

In mid-1992 access to the international Internet link began to be charged on a per-megabyte basis. Tuia Society members – the universities – were charged and sites connected through Tuia members were included in their account, although there was no specific breakdown. Third-party buy much traffic just got lost in the noise. However CSC knew that traffic from the WCC, which had a 48kbit/sec link, was on an exponential curve. In November 1992 it exceeded that of the whole of Victoria University, representing thousands of dollars a month in fees.

The council's CityNet bulletin board was offering anyone who had a modem, free access to public information through FTP, but the bulk of traffic was emails, software, and pictures from the wider Internet. CSC was now concerned about how Victoria's own traffic was going to be paid for. Other third parties including Actrix were beginning to have a significant presence.

Of course acting as an undercover ISP wasn't core business for the Computer Services Centre and presented a dilemma, said Stokes. "Our choices were to stop doing it, which didn't strike me as very sensible; charge through the nose, or try and provide the service on a cost-recovery basis. We weren't thinking especially commercially but certainly wanted to make it viable in the long term."

In December 1992 the VUW Internetworking Group was formed and Stokes and his boss Michael Newbery came up with a new pricing model. "We would pass on the international charges at $2.50 and charge 20 cents a megabyte for New Zealand traffic. We didn't care about local traffic because all it cost us was the trip across the 10Mbit/sec half duplex backbone at the university. The connected sites had to provide their own router and data circuit to us and we would plug that into our router." A router could cost $6000–$10,000; then there was the install fee, including adding new cards, which could be up to $4000. If clients wanted a 48kbit/sec DDS circuit that would cost $500 installation from Telecom and up to $3000 to install at Victoria. Then there was the $550 a month fee for the Telecom circuit and about $100–$150 a month access fee from Victoria, which was using Tuianet as its upstream backbone carrier.

By April 1993 the first quarterly accounts had been sent to seven commercial customers. Revenue for the first year in operation as a commercial entity topped $100,000 before expenses. By the end of 1994 Victoria had about 30 sites connected including the Ministry of Education, Wellington Polytech, a division of the Ministry of Commerce, bulletin board provider Actrix and a private connection for Clive Nicholson, a former DSIR employee who decided he couldn't live without the Internet. Within two years there were 30 connections into the Internet backbone via Victoria including a 2Mbit/sec leased line into Parliament Buildings. A link was created to the Internal Affairs Department and the archives library using the diagram Don Stokes had drawn up five years earlier, when he was employed by Government Print.

At this stage the finance people at Victoria University were beginning to raise their eyebrows. Even though providing Internet access was a sideline, administrators were advising them to use their own revenues to fund different projects. "While it was useful having a revenue stream we were mostly spending that on further Internet development rather than funding other things for the university, so we began to talk to the university's subsidiary company which dealt with external contracts."

In 1994 Victoria installed Comcor Technology (CTL) Comet V-Fast 28kbit/sec modems[14] on its analogue leased line service, and CTL agreed to design and build a rack-mountable version. Network Dynamics routers were deployed at half the price per port of Cisco equipment. This was the beginning of a relationship with Network Dynamics.[15] The department now had 25 leased line customers. Its revenues had reached $250,000, and it had to advertise for an Internet administrator.[16]

The Victoria University finance administrators were awestruck at the burgeoning example of capitalism under their noses. Consequently a fully commercial ISP, NetLink, was established as a subsidiary of Victoria Link Ltd and launched in April 1995. NetLink took over the university's UUCP dial-up business from Computer Sciences, along with the leased line business, the banks of modems and routers, email accounts and newsfeeds and even the Web services.[17]

Among the new services created at NetLink were 'Web presence accounts,' which included a domain name and web site with an email box. "Typically if you wanted a web site you had to own your own server but we figured out how ISPs could host multiple sites from a single server. With your domain and web site you got an email box, all for $100 a month," said Stokes.

In the early days of the Web, customer web sites hosted by an ISP usually appeared as:
http://www.isp.co.nz/customer-one/
http://www.isp.co.nz/customer-two/
The Web server was usually a single machine; for example: www.isp.co.nz.
CSC, however, used multiple IP addresses, and gave each IP address a name:
http://www.customer-one.co.nz/
http://www.customer-two.co.nz/

"We had to modify our Web server to recognise which IP address it was being contacted on, and to select each web site based on that. Modern Web servers provide a 'host' header which allows multiple web sites to use a single IP address, but back then hosting your own domain name without having to run your own server was new and cool."

NetLink continued to innovate, and in 1996 expanded into Christchurch with leased line and dial-up services and to Dunedin also with a leased line offering. It sponsored the general election Web coverage and deployed a 500kbit/sec NetRadio wireless Internet service using Proxim equipment. This operated through three antennas on the Cotton Building providing coverage over most of the Wellington CBD.

There were a number of Internet pioneers among the crew at NetLink in those early days: Web specialist Nathan Torkington, Milton Ngan, a computer science graduate who helped set up the early systems, Jules Anderson, Mark Davies, Duncan McEwan, Bernd Gill, and others who moved across from Computer Sciences. They all enjoyed working at the leading edge of the Internet revolution where few had ventured before. "We weren't terribly concerned about money. That only began to bother us a bit further down the track. In fact that was one of the main reasons I left," recalls Don Stokes.

He claimed NetLink was established partly on the understanding that he and his fellow innovators would be looked after, based on all the development, coding, and time they had invested in the ISP. "It was a tacit understanding but it never really happened. Even when Rowland Woods, the founding managing director at Victoria Link, left, one of the directors encouraged us to 'just keep riding that tiger.' We thought we had the tiger by the tail when we went from half a dozen connections to over a thousand customers across the country. By the end of 1996 we were making half a million dollars in profit on a huge turnover but we never got any financial reward for what we put in."

In 1997 NetRadio was deployed from roof of Hotel Grand Chancellor, the tallest building in Christchurch, as further evidence that innovation was still at the heart of the business. Then the former university ISP was spun out from under the university, with Colin Wallis as chief executive. The founding management team, Stokes and Wilson, resigned. The following year Wallis resigned and NetLink was sold to Telstra New Zealand for more than $25 million.

ACTRIX ACTIVATES FULL ACCESS

Actrix was both a pioneer of the hobbyist bulletin board culture and, through its relationship with Victoria University's Computer Science Department, was virtually pushed into the user-pays world. It agreed to take on some of the commercial customers Victoria was uncomfortable with, making it arguably the fifth[18] public ISP in the world.

"We were fairly much ahead of our time. We didn't fear competition because there was huge demand and everyone worked together. It was very co-operative. No one was trying to get rich off the top; they were trying to make a living by providing good service and it worked well," said Actrix co-founder John Vorstermans.

In November 1989 Vorstermans and business partner Paul Gillingwater escalated the Actrix BBS to Internet status when a 19.2kbit/sec leased line was connected from their Wellington offices to Victoria University. Once word got out that Actrix was now able to provide full Internet access there was steady demand. Most used Telnet[19] to access files, or PPP (point-to-point protocol) to send and receive email. Once you were logged in to the service provider you would use DOS commands to navigate your way around the green screen or the early Windows interface.

Actrix began offering dial-up access from about 1994 and soon had a couple of hundred users and six modems, charging around $15 per megabyte. "That was a huge amount of data in those days. We were only passing on what Victoria was charging us with a small margin to keep us going. It was still more of a hobby than anything else." At the back end was a leading-edge 386 server with a 150Mb disk capacity. "I think the initial computer cost $25,000. We were pretty serious and could see that this was going to grow hugely once it caught on. We had no competition until David Dix in Auckland started KCBBS a couple of months later," said Vorstermans. Over the next few years the Actrix team helped a number of ISPs set up servers and offered friendly advice, keen to see others discover this marvellous new resource.

The biggest cost was the $200 a month Actrix paid for a leased line into Victoria University and the charges levied by the university for each megabyte of data consumed. Victoria was eager to help the ISP grow and pass on business because it didn't want to deal with the public. So the invitation was extended for Actrix to move onto campus, where it upgraded to Sun Microsystems computers and added lines and modems as required.

Vorstermans said it was a magical time because of the co-operation and support within the small Internet community, which was working to create a unique new business. Some businesses understood email technology but most were slow getting on-line. The Inland Revenue Department (IRD) was one of Actrix's first serious customers making maximum use of email until it established its own connection. The Business Roundtable was another early customer. "I don't know if they knew what they were getting into, but they could see that it had potential."

Having an email address was still considered personal information; there were no directories, mailing lists, or contact details on business cards. You had to have a relationship with a person or company to be given their email contact details. Once the tools were available to access the Web, growth was unstoppable. "It went absolutely crazy and it became more difficult keeping up the demands of our subscribers. We were continually investing, and our costs slowly started coming down so we decreased our prices which made also a difference."

Vorstermans enjoyed the idea that he was facilitating communication across cultures and other boundaries. While the fax was given credit for alerting the world to the horrendous reaction of the Chinese military to the Tiananmen Square protests, he believes the Internet had a greater impact. "That's how the news got out almost instantly. Even though you couldn't get pictures out over the Internet at that stage the world was horrified when the first emails came out describing what happened. The magic was the ease of communications and that was the big attraction in getting a lot of companies on line."

In 1995 celebrating its sixth year as an ISP Actrix ran a supplement in the *Evening Post* to try to educate people about the communications revolution. Vorstermans was quoted in a reflective mood:

> *When Actrix was formed the Internet was for 'connecting propeller heads' and universities, and connecting to it was like going through an initiation ceremony… It was difficult to get a connection and to use it you needed computer skills. Now subscribers get an information and installation diskette. It asks them half a dozen questions and then automatically connects them… Popular sites on the Internet include electronic shopping where subscribers can browse through huge catalogues to shop for consumer items*

from Internet shopping malls. You pay the United States price and get it on your door within three to five days. It's amazingly efficient… You can (also) preview movies, records and computer software, look for a job and read the tourist pages.

In May 2006 Actrix introduced a $5 monthly 'community service' which gave users free email through the non-profit PlaNet New Zealand network. PlaNet trust manager Peter Hall-Jones supported the initiative, saying it was necessary because there was a growing 'information poor' developing, who didn't have access to technology. "I think this is a genuine and gutsy attempt to address that. PlaNet and Actrix have no mark-up in this. We've flipped all the switches and are providing it at cost to ensure the wider community is involved in these technologies."

Actrix was also getting involved in education, actively looking at ways to sponsor Internet use in schools and running several training courses. It had built a relationship with education provider CIT, which offered Internet courses that had been endorsed by the US Navy and NASA. "Things like this make the Internet so exciting. People are judged by the quality of what they put on the Internet, not who they are, who they know or where they are from. It wipes out elitism," said operations manager Peter Muller. Director and technical manager Hal King said he had always liked the community focus of Actrix. "All the directors are very community focused and see the benefit for the wider community not just the elite. The goal isn't to become rich. We want to see everyone benefit and at the same time try new technology."

Actrix moved back into the Wellington CBD in May 1996 with a team of HTML editors, graphic designers, and technicians:

Thousands of dollars worth of computer equipment are being silently carried out of the Cotton Building and into waiting cars and vans, their motors still running. The convoy makes its way through downtown Wellington until it reaches an old warehouse on the corner of Blair and Wakefield Sts. Servers, modems and computers are swiftly hauled inside and two hours later they're all on-line: the operation was a success.

Actrix… the biggest Wellington-based community Internet service provider has relocated… The last time Actrix moved they only needed to shift one server and six modems. This time there were 10 servers, 130 lines and capacity for up to 200 phone lines. Actrix' new headquarters is also the site for a multimedia centre which will incorporate a number of public access Internet terminals, a training centre and a variety of other entrance doors into the World Wide Web… Internet junkies were only off line for two hours.[20]

KC'S SUNSHINE BANDWIDTH

Although there was still a strong bulletin board community in the very early '90s, there were only three or four competitors in the ISP business in Wellington, including Victoria University (NetLink), Actrix and Richard Naylor's CityLink, which was established using Freenet software on behalf of the WCC. The bulk of activity at the time appeared to be happening in Auckland.

Kappa Crucis, the ambitious bulletin board system that named itself after a constellation in the Southern Cross and grew from a computer system at the Auckland Observatory, quickly became one of the most entrepreneurial Internet service providers in the country. KCBBS, KC, or KC Internet services as it later became known, pushed the boundaries. It served as a gateway for mail and news services, continually upgraded its equipment and its bandwidth with multiple paths out of the country, and supplied the latest equipment to start-up and existing ISPs. There were many outspoken individuals in the fledgling industry, plenty to gossip and rant about as the industry grew, and KC

founder David Dix, was himself never short of an opinion and maintained and published a running record of the disputes and industry fallouts.

KCBBS hosted an exponentially growing news service and throughput of email, inevitably stepping into the commercial arena where higher levels of service were demanded. Beyond its BBS roots, KC shifted to subscription-only access from 1 October 1992, charging $45 for 12 months, with more than 150 users responding. They were allocated their own personal log-in IDs with separate home directories along with standard Unix news and email features. It was also possible for users to access compilers and other development tools. Several users developed offline readers specifically for dealing with Usenet news and local message areas on KC.

In July 1993 KC became Internet connected via a 48kbit/sec Metropolitan Digital Data Service (MDDS) to Auckland University's Computer Centre. PC router boxes were used at each end with specially designed synchronous serial port cards in 286 PCs. However due to delays in IP number allocation and international routing being enabled at Waikato, it was not until the last week of August that complete IP services were available to KC users. IP access was charged at $20 per month, payable six months in advance, and 37 users signed up for that first term to February 1994. From 1 October 1993 KC's subscription was increased to $50 a year and user numbers grew to 167. As the world moved to the Windows interface on PCs and Web browsers came into common use Dix began sourcing higher-end equipment for hosting Web pages. "By the time graphics applications became mainstream I had already established 200-300 customers wanting to use early browsers and helped about six companies set up Web servers."

However PCs didn't really have the capability to drive a Unix system. One of the most secure operating systems available was Sun Microsystems' Sun OS. Dix made contact with a firm that had a dozen or more Sun SLC machines left over after completing a large contract supplying Sun equipment to a New Zealand corporation. These were the same powerful Sun Sparc One boxes being used by Internet providers offshore. Dix purchased a number of them to bolster his own capabilities and sold others off to struggling start-up ISPs. "I didn't want them suffering their way through a Windows 95 system."

Within a month Dix swapped out the 330Mb drive on his Sun SLC for a 1Gb drive. Alan Marston's Auckland PlaNet BBS system was established with a direct connection to the KC Ethernet network in October 1993. This was a Linux-based 486DX33 system with two phone lines and 600Mb of disk space, giving PlaNet full IP access. It initially used one of the KC IP numbers until it obtained its own IPNetwork in March 1994. Dix had acquired a further Sun IPC system for himself in December 1993 and his old PCs were shut down and sold.

As word got around that he had access to high-end Sun machines, he on-sold about 20 units. Actrix took one, as did nine members of the new PlaNet co-operative network; two went to Jon Clarke for use at the Iconz and his Status BBS. ISPs setting up in Christchurch, Dunedin, and Nelson also placed orders. For those who were new to the game Dix was able to supply an 'ISP in a box' preconfigured with sufficient memory, operating system, and hard disk. Those who already knew what they were in for were simply glad to add this leading-edge equipment to their back-end systems.

A little later on, when US-based on-line auction site eBay launched, Dix went trawling and discovered that UltraSparc and other high-end Sun systems less than 18 months old were selling for a fraction of their new price. "That really boosted a few people along." Dix began adding further value to his ISP business by offering his clients top-of-the-range Sun machines and Cisco routers and installing and configuring them for Internet access. By this time he'd established offices in Queen Street and was employing up to four engineers. KC continued to upgrade its Sun systems and acquire faster disk drives, system software, development tools, and ISP programs for the Sun operating

PLANET UNDER SIEGE

The PlaNet network, like Actrix which helped get it up and running, had an environmentally friendly, left-leaning ethic. The rapidly growing affiliation of ISPs around the country was often engaged in public good efforts, promoting community connectivity and attempting to prick the social conscience. However the unwavering political and philosophical leanings of some members led to fractures in the fabric.

PlaNet was directly descended from Actrix's Springboard BBS and involved activists from The Other Economic Summit (Toes)[21] group, including Chris Lyttle, Alan Marston, Alan Brown in Palmerston North, and Mac expert Don Robertson in Auckland. It was first launched as a co-op in Auckland in 1992, with environmentalist social-networking goals and a UUCP shareware technology template. The PlaNet concept seemed to perfectly mirror the mood of sharing and caring that abounded in the early Internet community, as like-minded people across the country and the world discovered each other on-line.

In Auckland Alan Marston and Peter Hall-Jones initially built their network among progressive non-governmental organisations (NGOs), and then Hall-Jones moved to Wellington to establish an operation there. Marston started to work with David Dix at KCBBS, and in fact operated from the same premises for a time. Alongside Actrix, the original PlaNet group soon represented a large percentage of the early adopter Internet customer base in New Zealand and was the first ISP to offer local call coverage for most of the country. They were also the first to offer free public Internet access through Auckland libraries and later free Web hosting for non-profit organisations.

Independently, but within the same time frame, Robert Hunt's family trust in Christchurch was running Ecolink, a bulletin board system that was also seeking to become part of a co-operative nationwide effort, and link with similar networks focused on environmental and peace concerns. Ecolink became an affiliate of PlaNet, which Hunt insists was not dominated by any one person at the time. Hundreds of community groups and NGOs were assisted in their efforts to get on-line with their first email and Usenet connections and later their first Web presence. The PlaNet nodes offered free tuition at a time when people's awareness had scarcely emerged, he said.

In Palmerston North Alan Brown, a former Telecom microwave technician, had built up a network based around Massey University[22] known as Manawatu Internet Services.[23] Other key members of that original PlaNet community included Hunt's operation now known as PlaNet Canterbury, Chris Lyttle, Don Robertson, and Don Anderson, who operated the Wellington PlaNet node, which piggybacked on Actrix servers, Sarah Courtney and David Pate, who operated in Wanganui, Chris O'Donaghue, who started the Nelson node, and Earthlight in Dunedin, which was run by Brett Shand and his family; their son Adam Shand was the administrator and ended up working for Internet Alaska. By 1995 there were also PlaNet operations in Rotorua, Taupo, and Gisborne.

The PlaNet network members then formalised a not-for-profit trust, which Marston described as a body to co-ordinate national services. Then there was an about-turn; he was demanding a more anarchic model of activity, stating that in his view democracy didn't work. Hunt, who was running the PlaNet

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Canterbury node, recalled Marston had a very complex, progressive philosophy. "His father was a noted trade unionist, there was some involvement from people in the Socialist Unity Party[24] and it all became a bit too politically intense for my liking. I was still interested in good works and had an enthusiasm for us getting a national trust together and tried to get membership of the Association of Progressive Communications (APC) internationally. However that seemed to be a bit of a paper tiger and a waste of time. Most of us held together fine as the PlaNet Trust until the case for non-commercial activity seemed to fade."

According to Don Anderson, Marston ultimately wanted every PlaNet node to own and operate its own lines and equipment. "PlaNet Wellington was in the unique position of having John Vorstermans and Actrix as a supporter. It was a win-win situation, as he'd been the founder of Springboard, and was incredibly supportive of what we were doing. We decided to operate as a virtual ISP, with connectivity via Actrix offered to progressive networks, while we focused on providing education and support for community organisations and NGOs. This meant that we needn't be distracted by the costs and investment required to run an ISP."

Hunt and other members of the PlaNet network continued to look for some international or local umbrella under which they could operate and expand their greater good consciousness. The ongoing stumbling block seemed to be around establishing a business framework. "I proposed we set up our own national backbone and start doing some more business-oriented things with the various nodes, as there was a good case for that. I suggested we get some lawyers to set up a suitable joint venture structure. Then David Dix objected, saying he didn't want to have anything to do with lawyers. John Vorstermans from Actrix said, 'Well if that's your attitude then we can't do business' and I was inclined to agree," said Hunt.

About a month later Alan Marston stunned the others in the community with his announcement that he in fact owned the name PlaNet or planet.*.nz, despite the fact that he and other nodes across the country had formed the PlaNet Trust and were using sub domains; for example, ak.planet.org.nz, wn.planet.org.nz, and chch.planet.org.nz. Hunt, who believed he was part of an evolving movement that stood for peace, love, and happiness and everything green, was shocked. The managers of the various PlaNet nodes had been involved in sponsoring each new node into existence, helping them with initial setup and even hosting them when it was required.

"Alan decided he had thought the whole idea up and had a right to control policy for all of us, but this was a serious distortion which, as much as anything else, led to the ultimate fracture of the movement." The claim that Marston owned PlaNet was also at odds with the philosophy of co-operation that everyone else had agreed to. "He even went as far as to send out letters from a lawyer to each of the different regions instructing us to either follow his directives in matters of operation and business, or cease trading as part of PlaNet in New Zealand," recalled Hunt. Marston's announcement was so contentious it sparked what became known as the 'Planet wars.'

Further shock waves hit the Planet community when David Dix, at the time a friend and technology provider for Alan Marston and a number of the

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other PlaNet nodes, rang Rex Croft, the person responsible for registering and managing domain names at Waikato University. The call was placed late on a Friday night, asking him to reassign the Wellington Planet name servers to someone more aligned with Marston's particular political flavour, said Hunt.

Without the agreement of the PlaNet Wellington group, many of whom were also members of his Auckland co-op, Alan Marston arranged for Dale Spittle to take over running the Wellington Planet node. According to Don Anderson, Spittle had met some of the PlaNet Wellington trustees earlier, at his request, but they weren't happy with the idea of leaving Actrix. Despite pressure from Marston, the trustees saw no reason not to continue with their co-operative arrangement. "It was then that things got really nasty, with an appalling breach of etiquette."

Anderson's Wellington ISP, operating under the planet.co.nz domain, might well have been left high and dry, its customers unable to connect to the Internet, if Alan Brown from Manawatu Internet Services had not refused to allow the domain reassignment. An urgent meeting was called, which Marston initially agreed to attend, where it was hoped all the issues could be resolved. So representatives of various nodes from around the country flew to Wellington for a meeting, but Marston didn't show. Anderson, part of the Wellington collective, was at his wits' end and stated the only place to sort things out was in court. As a result proceedings were initiated in the Wellington District Court to challenge Marston's claim and to stop any further action to transfer domains without consultation. Anderson represented Planet Wellington, and Alan Brown represented PlaNet Manawatu. Robert Hunt said everyone thought the threat of court action would result in Marston backing off but he insisted on defending his action.

When the acrimonious showdown ended up in court in April 1995, both PlaNet Wellington and Alan Brown from Manawatu put their case. "Brown was a techie guy and had a habit of using geek speak all the time. One of the memorable moments during the case was when Judge Lee had to stop him in midstream, when he was babbling on about Usenet and other details of the services provided. 'Mr Brown, I am from Mars, please speak to me in the clearest possible language, and slowly so the stenographer can write it down,' but Alan, was incapable of not talking geek speak," said Hunt.

After the first day of a two-day hearing Judge Lee expressed her frustration, saying it was a bit tragic that such good people having community concerns were having a go at each other. She explained before the case began that the outcome would most likely result in each group being given trading rights to operate in their particular geographic area under the Planet name, which would not be totally satisfactory to either party. She told the two barristers their clients needed to sort out something to bring to court the next day, and she would execute court orders based on the best ideas. "I thought that was very insightful. So we had an evening meeting directly afterwards and I proposed we (the nine other PlaNet operations) keep planet.org.nz, while Marston could use planet.gen.nz. This would make sufficient distinction between the parties. Marston would also resign from the PlaNet Trust, while Hall-Jones,

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Lyttle and Robertson resigned from the Auckland co-op. In other words there would be a parting of the ways."

The court agreed, and Marston and Spittle went one way with the planet.gen.nz domain (after agreeing not to trade as PlaNet, but as PlaNet FreeNZ), and the rest of the PlaNet nodes kept planet.org.nz. However Marston soon reverted to using the PlaNet name and registered pl.net. Hunt said the whole court case was costly and disruptive. "It wasn't very healthy and gradually most of us left the planet side of things. PlaNet Canterbury became Cyber Express, PlaNet Wellington transferred its clients to Actrix and concentrated on progressive Web projects and PlaNet Nelson became Tasman Solutions."

Anyone not knowing the feisty history of the once 'co-operative' movement could be forgiven for thinking everything is and always has been politically correct. The remaining site, now operated by Marston as www.pl.net or ak.planet.gen.nz, states it is "the product of co-operation between people involved in Internet services" with clear service standards. It leveraged its "combined network structure and economies of scale" delivering "socially and environmentally conscious Internet and media services."

Today the remaining vestiges of Marston's PlaNet co-operative insist users of its services not "break the laws of New Zealand, promote violence or do anything that is ecologically or socially unsustainable." By facilitating interdependence, the PlaNet philosophy could produce sustainable businesses and lifestyles. "In short if you believe in co-operation, that business is personal and money isn't everything, then we can add ethics to your Internet."[25]

NB: Alan Marston did not wish to contribute or respond to questions put to him for this book.

system. Through early 1994 he obtained various Sun peripherals, including CD-Rom drives, tape drives and various serial bus cards, and accelerated graphics cards.

In August 1994 a Sun SS1+ system was purchased and dial-up SLIP (serial line interface protocol) was enabled. Within weeks there were more than 50 users dialling in direct to the Internet via KC. The first IP connected 'down feed' site was a 9.6kbit/sec MDDS link for Transdata Corporation in September 1994. In October a DEC Brouter[26] replaced the PC router and a 48kbit/sec link metropolitan digital link opened to Auckland University. PPP was used to increase reliability. Usenet news now accounted for about 25 percent of the bandwidth. News averaged 220Mb per day with over 3200 newsgroups. The Waikato link was increased to 128kbit/sec.

In January 1995 two more IP sites installed MDDS links to the KC network, with clients taking a range of offerings from 9.6kbit/sec to 48kbit/sec. The news server disk was upgraded to 4.3Gb, improving the overall performance. The Usenet news partition size was increased to 2Gb. In the first week of May 1995 a new 64kbit/sec MDDS link was installed and a top of the range Cisco 4500 router was ordered. His client list now read like a who's who of business, from dairy companies to publishers, ISPs, software developers, and even the Auckland City Council IT department.

A primary rate ISDN connection with ten 64kbit/sec channels was ordered from Telecom for installation in mid-August, and a Spider Mezza router with primary rate ISDN interface and triple X21 interface controller was ordered from Kaon Technologies. At the start of October 1995 a Cisco 4500M and a Cisco 4000M were ordered after a series of discussions with Telecom, which had agreed to install a stacked wide-band digital data circuit at both KCCS and Waikato. Kaon Technologies connected

at 48kbit/sec over the MDDS in early October, and Intouch took over the KC end of the MMDS from Auckland University. The Cisco equipment arrived in December and wide-band negotiations with Telecom accelerated. The connection was in place on 20 December and customers were gradually migrated. Terabyte Interactive upgraded from 48kbit/sec to 64kbit/sec to allow it to provide an on-line Web server over the New Year period to monitor the Sydney-Hobart yacht race.

As 1996 dawned, life was good for KC, with new customer enquiries every day. Plans for the new stacked wide-band DDS services at Auckland, Hamilton, and Wellington looked promising and customers were committing to connections into all centres. The Net, an ISP in Hamilton, connected to KC's router at Waikato via a Telecom 48kbit/sec MDDS link. Telecom, however, missed its 20 January deadline for installation, saying it would be in place within a couple of weeks. Existing customers continued to upgrade their links as business grew. The newly formed PlaNet Hamilton connected to KC's router at Waikato University. However by April it became obvious Telecom was not going to proceed with its promise to install stacked wide band for KC at Waikato. This resulted in four companies making other arrangements for their Internet connections. The most serious cost of this affair, apart from the loss of several potential customers, said Dix, was that expensive Cisco routers and controllers had been purchased to manage the service, resulting in a large financial loss for KC, which stumped growth, especially in the Hamilton area, for the rest of 1996.

Dix recalled just before Telecom's Xtra ISP went live in May 1996 it had sent technical staff around to check out how several different ISPs were operating their businesses. "They gave the impression that Telecom was in the market to buy an ISP or look at ways of having closer relationships with existing providers. Iconz thought they were a candidate for Telecom buyout and even Alan Marston was fooled. They sent two guys to snoop around for half a day looking through his stuff. They were just learning how the different ISPs were doing stuff," said Dix, who had always hedged his bets. He had access to two or three international suppliers for Internet bandwidth. "We would never align with just one, even though Telecom, Clear and Telstra all wanted us to sign up long-term contracts. Anyone who did that was crazy."

In May 1996 KC continued moving existing DDS customers, and a dozen or so new customers to its primary rate Centrex ISDN service, which provided a low-cost option for Internet connection. The process was completed for KC to obtain an ISDN Centrex Basic Business Group (BBG) number at an overall cost of $130 per month for a 128kbit/sec link. A number of clients moved to basic rate connections during July, and there were eight more enquiries before the end of the month. Contracts for MDDS, ISDN, and DDS links continued to grow, along with demand for higher speed connections. The Cisco 4000M at Waikato was upgraded to a Cisco 4500M, and link compression was enabled over the 512kbit/sec line to KC in Auckland.

July saw The Net in Hamilton and Hamilton PlaNet move from a Telecom 48kbit/sec connection to a WaveLan radio connection to KCs router at Waikato University. The main KC computer in Auckland was upgraded to a Sun S4 110MHz model with 64Mb RAM, a 500Mb internal drive, a 1.4Gb external drive, and a Sun Ultra 1-140 replaced KC's old news server.

Negotiations with Telstra began in August for an international link, which was finally installed in December. Meanwhile more smaller ISPs began linking through KC. Expansion of the various computer capabilities and network components continued to keep pace with growth, and in October a second primary rate ISDN (PRI) circuit was installed for KC. "This appeared to be the last Telecom had available as it was widely reported in the computer press that Telecom had no further ISDN resources available at the Mayoral Drive exchange." After ongoing efforts to connect various servers and interfaces to the PRI it became clear it was not operational. Faults were reported to Telecom but problems continued and in the end the PRI was unusable, said Dix.

Peace Computers ordered a basic rate ISDN connection to KC's Centrex ISDN but this was back ordered by Telecom. It wasn't resolved until December when the price had gone up. "Peace managed to get Telecom to connect under their original scheme due to the long delay in provisioning the Basic Rate ISDN (BRI) service." Dix had a meeting in Napier to look at setting up a connection with Auckland, largely because it became clear that Telecom's charging schedule showed a greater number of 'lower cost steps' to Napier than any other North Island location. "With DDS connections from Gisborne to Wellington it was possible to provide a minimum cost connection for up to six ISPs, most of which already connected to KC's router at Waikato." Kapiti PlaNet moved from a 48kbit/sec connection into Wellington PlaNet and became the first ISP with a 64kbit/sec DDS connection to the new Napier hub. Wellington PlaNet also moved its 64kbit/sec DDS from KC's router at Waikato to the new hub at Napier.

By late January 1997 the process of moving to Telstra New Zealand for international data services was well underway. In July 1998 a new Cisco 7507 router was ordered to replace those used to connect the dial-up users to Centrex ISDN and stacked wide-band DDS links. It would also connect the Megalink circuits to Telstra and Newmarket. KC continued on an aggressive upgrade path for all of its critical equipment with older modem servers and cards redeployed at other smaller ISPs.

LOOKING FOR GOLD IN KIWI LINK

Photographer Chris Miller first got involved with bulletin boards in the mid-1980s when he created an early mail gateway for a number of BBS including the NZMC, where he was a committee member. His interest in taking things a step further was piqued when he saw his friend David Dix had discovered how to bring in Fido Mail and Echo Mail directly from the United States via the Internet. Dix advised Miller to "get out of that DOS crap and into this real Unix stuff." In April 1994, Miller, having completed a two and a half year photography contract helping create catalogues for The Warehouse, finally had time on his hands and began reconfiguring his system to explore what the Internet had to offer.

Dix had already made the transition from BBS to ISP with his Kapa Crucis (KC) system and offered to teach Miller how to work with Linux,[27] a variant of Unix. Because Alan Marston, the founder of the PlaNet co-operative, was co-hosting his equipment at Dix's home with a direct link for Internet access, Dix suggested leveraging the PlaNet model so Miller became PlaNet North Shore but with Auckland-wide coverage. "We started with a couple of Sun boxes, a couple of PCs, a news server and it just grew and grew until we had to add more Sun boxes."

However Millar began to get a growing number of calls directed at the PlaNet network. Confusion over the name resulted in him changing to become KiwiLink.

While Miller set up the back-end equipment and managed the Internet systems he kept working as a professional photographer, leaving the running of the ISP and Web hosting business to his wife Fiona. "I kept the servers going, upgraded everything and kept in touch with what was happening." In many ways the Millers were way ahead of the game, particularly with their attempt to establish themselves as an e-commerce provider, hosting secure Web pages with transaction capability. However it was a little too early.

They set up New Zealand Products Link, with a focus on selling New Zealand goods offshore, and began approaching the banks to find a means of taking secure transactions on-line. "The banks ran a mile from us; they wouldn't have anything to do with it. There were no secure keys around and everyone was scared of the Internet. In those days there wasn't anything on the shelf so we asked our technician, Richard Harkner, to come up with a secure key. He found some code offshore and cobbled it all together from scratch. It cost us a bloody fortune. In the end the banks finally gave us

a Visa solution we could use on-line but we just couldn't get traction. There weren't enough people buying and in the end it got too hard. We didn't have deep enough pockets."

In 1995, the focus shifted back to being an ISP, servicing dial-up customers, and providing secure Web hosting for businesses and other ISPs. There were few ISPs hosting Web pages at the time and that side of the business grew quickly, which was just as well because serious competition in the ISP market meant people were falling over themselves to get dial-up customers. KiwiLink's niche, and in particular Miller's specialist knowledge and ability to deliver a range of on-line tools for Web page publishing, was his saving grace.

"I think we would have been one of the first to have MySQL available. We were also early in hosting 56kbit/sec modems but Telecom's lines were such crap and they couldn't support them for the use of split pairs on the phone lines. It improved over time but Fiona got sick of people ringing in 24 hours a day with, 'My Internet doesn't work! It's your fault…' If they couldn't get me at work they'd dig through the phone book and ring me at home. It got too much." Miller leased the system to a third party for a time and finally sold Kiwilink in 2004.

"It's interesting looking back at all the big guys who said they were going to squash us little guys; people like IBM and Voyager. So where are they now? They thought they could win over the market with deep pockets. They were very aggressive, making it clear they didn't want us in the business." Ironically Miller recalled hosting Web pages for Xtra when it first started. "They didn't know how but they cottoned onto it pretty quickly." He still runs the mail server and Internet technology for his own web site and for delivering images for professional photography, but he's left the commodity Internet business to others.

NOT PLAIN SAILING

Plain Communications (PCL) prides itself on being the oldest full ISP in Canterbury and alleges it was the first New Zealand ISP to offer commercial Web hosting. The company was founded in 1994 by Robert Hunt who said his was the third ISP in the country to offer PPP and SLIP access accounts to the Internet.

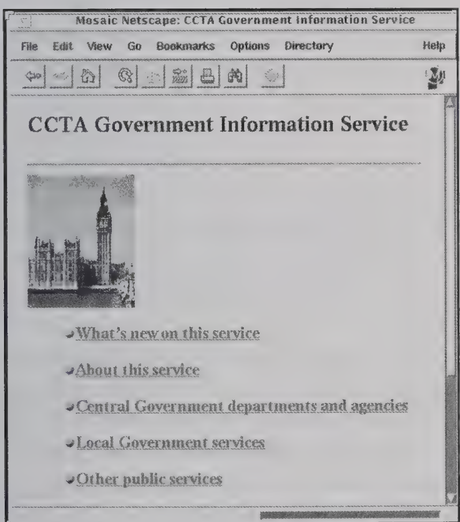
Hunt's involvement came through flatting with Robert Biddle, who was completing his PhD in Computer Science at Canterbury University in 1985.[28] Biddle, who had first-hand experience with early Internet access through being an academic in Canada, inspired him with the knowledge that he could connect to the United States and get access to Usenet. Biddle introduced Hunt to an Amiga-based BBS called Equinox run by Jeff McCaughan. "I was an annoying user of Jeff's, subscribing to Internet email. They would have to dial in to the University of Canterbury to get the email and sometimes they would even go in and download everything on to a disk. Later he started a company called Southern Internet, which was sold to Iconz."

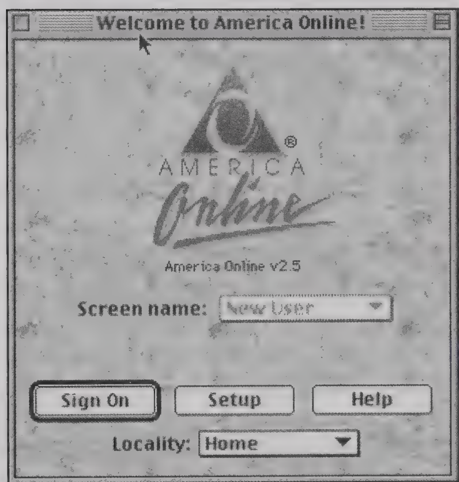
Originally the ability to set up a Unix-based system with decent bulletin-board services to enable people to dial in at 1200 or 2400 baud and get Usenet newsgroups, was as scarce as hens' teeth, said Hunt. Actrix was lucky because of its interactions with Victoria but most others had to learn the hard way. Hunt's first contribution to the on-line world was the Echo Link bulletin board, focused largely on assisting people within environmental organisations and the peace movement, to have affordable international communications. "I felt that was a good thing to do. It was largely a hobby, and we just upgraded to running what we believed was a jointly created node of the PlaNet network, that was looking to establish co-operation between smaller ISPs." Hunt began operating as PlaNet Canterbury.

PCL was a holding company established by Hunt and his family, essentially a not-for-profit trust. "That's how a lot of the early ISPs began, believing it was part of the 'acceptable use policy' to be

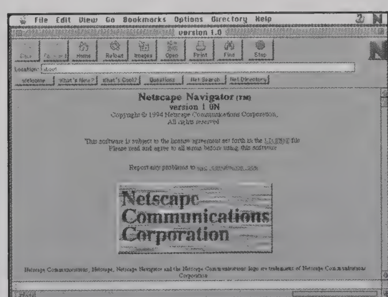
non-commercial. We knew that was going to change but we didn't quite know how it was going to pan out." Planet Canterbury was running UUCP and providing copies of newsfeeds and email and ferrying this to and fro from people's PCs. The DOS program, called Waffle BBS, was popular with early customers.

Then came the historic fallout between elements of the PlaNet network, and Hunt shifted his trading name from Planet Canterbury to CyberExpress. He continued to provide dial-up Internet and opened his commercial Web hosting business in mid-1995. One of his earliest customers was the *Christchurch Press* newspaper, managed and run by Webmaster Peter Wiggin, who later wrote the book *Wired Kiwis*. At its peak CyberExpress had 3500 dial-up customers, which eased back over the years as attention shifted to broadband. Even then Hunt was reluctant to move up to fast Internet. "We felt the things on offer from Telecom were so marginal that it was pretty much a losing scenario and we found relationships with Telecom quite difficult from the beginning."





The first version of Web browsers Mosaic, Netscape, and America On-line.
Images: John Pratt.



7

Craving for connection II

The pioneering ISPs

Telecom did not appear to be using a dominant position to harm competitors, and was simply using every incentive to keep its access prices as low as possible to encourage the market to expand more rapidly. And the competitive process in the relevant markets was less likely to be harmed now that Clear had arrived and Telstra had announced it would also be entering the market.
Commerce Commission findings reported in Aardvark, May 1997.[1]

As the Internet moved into the mainstream providers began battling to gain customers and keep them. The pressure was on and new, more powerful players wanted in on the action. Out came the marketing tactics and the dirty tricks. Rampant egos were to the fore as the industry experienced price wars, legal threats, spamming, denial of service attacks (DoS) and yes, even death threats.

It wasn't a game for the fainthearted as the laid-back attitude of the techies from the bulletin-board days gave way to the need for more robust systems and business nous to keep the customer satisfied. Growing demand from home users wanting access to newsgroups and email resulted in the Status bulletin board system transforming into the Iconz in 1992 and relocating its equipment from a Parnell garage to Airedale Street, opposite the Telecom central Auckland exchange.

Founder Jon Clarke and technical manager Craig Whitmore added marketing and business manager Chris Thorpe and others to the team and began looking to expand beyond home users into the business market. One of its first customers was the Pelican Bar on Elliot Street, run by brothers Tim and Nick Wood.

Brian Rudman of the *NZ Herald* interviewed the brothers at the height of their careers in the ISP business. As preschoolers in Singapore, where their father John was stationed as an airline pilot, the Wood brothers had sold fruit from their neighbour's tree around the apartment block, until their mother, Jan, found out. Back in Auckland 14-year-old Nick grew his own pot plants and sold them to raise money for his first computer, a Commodore 20. He started reading programming books and was soon hacking into primitive computer games to see how they worked. Then he developed his

own games including one called *Nicktron*. He would copy them onto cassette tapes – the storage medium before floppy disks – and pack them with instruction sheets coloured with felt pen.

"I flew around the country selling them, 20 at a time, to the computer stores. That's how I raised the money to buy my first IBM computer." By that stage Nick was 18 years old and off to university, where he took degrees in commerce and computer science. He lasted one term before he got bored and moved on to teach himself cooking, working at a series of restaurant and hotel jobs, then joined his father in Los Angeles, where he was on a three-month posting. Nick stayed two years, pumping gas, selling art prints, and discovering the pre-Internet on-line experience offered by CompuServe. With his US connections in the print business he started an operation back in New Zealand selling at factories and door to door. This proved more lucrative than the underground bar in Auckland's Elliott Street which he went on to run, and the restaurant in Queen's Arcade operated by brother Tim. The restaurant got off to an inauspicious start when dozens of police turned up on opening night and closed it down. Some technicality regarding the licence, said Nick. After that the police became regulars at the Pelican Bar, which was also a live entertainment venue.[1]

Nick Wood, who had been keeping an eye on the evolution of bulletin boards, and following his earlier experiments on CompuServe, knew that when the Internet arrived on the scene it was worth pursuing. "We converted the bar into more of a nightclub-cyber cafe with a bunch of Internet terminals and networked computer games. I think it was the first of its kind in the South Pacific." The venue often hosted university bands, including Supergroove, but the row of computers also began to attract a steady stream of customers eager for their first taste of on-line activity.

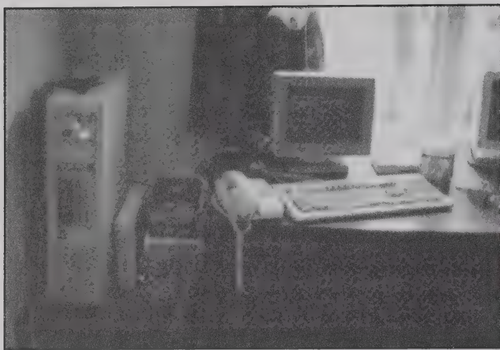
Even for the regular clientele of university students this was cutting edge. "It was the first time people had latched on to the World Wide Web and Internet relay chat (IRC)[2] where you could talk to people around the world in groups." The club took a feed from Iconz but Nick Wood wasn't impressed with the customer service. Fed up with system failures and downtime he paid a visit to owner Jon Clarke and convinced him he needed a more reliable service. Clarke agreed to let Wood set up a system alongside Iconz equipment in return for assistance with helpdesk and customer service support for home users.

Wood plugged his two Unix computers and related terminals and access equipment into Iconz network with a coaxial cable, ultimately believing the two operations would join forces. Iconz would handle the business side, and he would handle the customers as the Internet Home Users Group (Ihug). Early in 1994, Iconz had around 18 dial-up lines and a 48kbit/sec MDDS circuit to Auckland University. They were charging $50 per Mb for email and $10 per Mb for data.

Knowing the technical obstacles to entry Nick Wood began doing home installations and developed a self-installing disk that made it easy for customers to set up their own connections. "Prior to that you had to set up their modem and do some command line stuff to download software from your ISP and then hand configure it, which was all very messy. We built a Windows application which would let you download the software from a floppy disk and automatically set up a script so you could dial up straightaway."

The company showcased its new, user-friendly approach at a computer show at the Ellerslie Showgrounds in mid-1994. However the relationship between Iconz and Ihug was to be short-lived. Founder Jon Clarke worked for the Hong Kong Bank and was about to be transferred to Hong Kong, so he and business partner Chris Thorpe began looking for investors to take the service to the next level. That wasn't what Nick Wood had in mind. He wasn't ready to sell any part of his business and could see that if he persevered there was momentum for serious growth without having to sell out.

Systems administrator Craig Whitmore worked for both operations and as Iconz and Ihug went their separate ways he walked across the hall and joined Ihug as a business partner with Nick



David Dix's Kappa Crucis Bulletin Board System (KCBBS) in Auckland originally based in his home (more details), was an inspiration to many others to join the on-line community, including other BBS which he helped establish.
Photo: David Dix.

Wood. The two eventually gathered up their technology and shifted across town.

ICONZ DISAPPEARING ACT

Business at Iconz was booming, and Clarke was keen to upgrade and expand his access equipment but a little short on the dollars to make that happen. He met a 'business person' who seemed to have the answer to his dreams. The enthusiastic individual claimed he could help the fast-growing ISP keep pace with market demands and bankrolled some seriously grunty new equipment. Then came the bombshell.

One Friday night there was a visit from the police, who unplugged and removed all the new Iconz hardware to the sixth floor of the central Auckland police station. Important data necessary to keep operating was on a 1Gb disk drive. After convincing the sergeant in charge, Clarke was given permission to make a tape back-up copy. So he and David Dix from KC Internet took a Sun SLC computer, disk and tape drive, spare disk case, and all the cables to the police station only to discover the lifts weren't working. They climbed six flights of stairs with arms full of technology to the office where all the hardware was stored.

The sergeant in charge of the case wanted to know why the contents of the disk were so important. After some explanation about user password files and the operating system that were essential for Iconz to continue in business, he suggested they just take the disk. The police had no desire to see Iconz become a casualty of the equipment thief and were convinced Clarke had done no wrong. Within a day or two Iconz was resurrected, and all the existing users notified that there had been a disk problem which was now sorted out.

Apparently most of the equipment seized by the police had been obtained through credit card fraud. The so-called business partner had created the scam while working for a company that sold PBX equipment. He had acquired a pile of credit card carbon-copy forms from a retail outlet in Newmarket to get names and card numbers, then convinced retailers to deliver goods to an office address. The couriers would then be intercepted by this person or an accomplice just outside the office, often in a high rise in central Auckland, saying they had urgently been waiting for the disk drives, screens, modems, or whatever equipment was being hijacked. The courier, in a rush, would be glad to get a signature and head back down to street level. The supplier never knew anything was wrong until a month later when the real credit card owners denied ever purchasing the products.[3]

By 1995 Iconz was offering dial-up access through branches in Auckland, Wellington, Hamilton and Christchurch, as well as Pacnet access for dial-in from other centres. It was the catalyst for getting a number of other ISPs on-line, including Midland Internet in Hamilton formed by Bryce Farmilo and Simon Lyall in mid-1993. It devised a groundbreaking solution to connect to the Waikato Internet gateway using 1.6Mbit/sec Lucent Wavelan radio link for its main feed.[4]

Iconz moved to Beach Road, closer to Auckland's waterfront, and ahead of plans to sell up there was much talk about the Telecom data link it had to Waikato University. The company's advertising

claimed its 1Mbit/sec speed was faster than any other Auckland ISP. "Then someone pointed out that it was in fact a 128kbit/sec line. The comeback was that the way it was used was in fact equivalent to a 1Mb link. Someone at Waikato entered into the fray, explaining the link was in fact not a wide-band link or a Megalink. Once the reality sunk in along with the embarrassment the advertising ceased, and the 1Mb claims were was never mentioned again."[5]

Kim Schienberg from Panix.com, a New York–based Internet hosting company, invested in the business, which was sold later that year to Ron and Chris Woodrow of Mitsubishi distributor Melco. In 1998 Iconz added 56kbit/sec modem capability and purchased three new Cisco boxes capable of handling 120 phone lines each. It was getting more serious about the business market not only providing videoconferencing but voice over IP. In 1999 Iconz was acquired by Asia On-line, a subsidiary of Softbank (Japan) and in 2000 changed its name to reflect that new ownership. Paul Budde described the ISP as "the Swiss army knife of ISPs with something for everyone." It had begun to refocus on more influential and profitable accounts with specialised services and products including access, Web design, e-commerce, hosting, and systems integration as different prongs of the business. In 2000 it admitted to having around 30,000 subscribers; more than half of them businesses. Iconz later reclaimed its original trading title and continued to operate as one of the more respected second-tier operators.

IHUG AIMS FOR THE SKY

Splitting from Iconz in early 1995 was a turning point for Ihug, with Tim Wood selling up what assets were left in the Pelican nightclub and cyber cafe to join his brother Nick in the new business venture. Their father John weighed in with financial help, making the operation, now located in Newton Rd, a family business.

To survive and move beyond the couple of hundred customers Nick Wood and systems administrator Craig Whitmore had been servicing, they needed their own access pipe and to ramp up the modem banks and equipment. "Tim had been on the periphery and our father put up several thousand dollars to help us out and try and take Internet provision to the next level. We didn't go around raising capital; everyone just got involved," said Nick Wood. "We had some short-term debt and overdrafts but once we got through covering the cost of setting up, the service pretty much funded itself."

The focus remained on being a domestic provider. Users were charged a set-up fee and a monthly fee of around $10 per megabyte to start with. The only real competition in Auckland was from a few fringe ISPs and former partner Iconz. Initially systems administrator Craig Whitmore, who had been offered a partnership in the company, said there was no real research and development, just lots of good ideas and a willingness to try anything and see if it worked. Sometimes the system would go down for several hours at a time but without serious competition everyone just took it in their stride. "Imagine looking after 500 run-of-the mill dial-up modems. One or two would die each day and you had to check them all every day to make sure they were working. It was a big hassle. Every one of those modems represented a single Telecom line. We used up all the analogue copper lines in the street at one point," said Whitmore.

Nick Wood put his computer skills and software coding to good use. "I wrote the billing software for the company, mixed it with monthly charges from people's accounts, got all the web sites organised and managed the mail server." Wood had a mix and match of technology, which worked reasonably well but there were times when he was living at Silverdale, just north of Auckland, when he had to drive into town – sometimes twice a night – to reset everything. "Linux was still a very new operating system and it wasn't always that reliable and neither was the hardware. We had

scripts written that would tell us it had fallen over and you would be halfway home and have to turn around and drive back and kick it in the teeth. That was only a small part of the network but it was still a pain in the backside."

While most other ISPs seemed content with trying to capture a localised market, at least within their free calling area, Ihug was not only looking for nationwide coverage but for an independent route out of the country so it didn't have to rely on the Waikato gateway. Ihug had already had run-ins with Telecom trying to get enough lines to keep up with its growth curve. "They were forcing everyone to pay per megabyte without any other options, and as soon as the university stopped providing access to ISPs they put the price up and started to control the suppliers' bandwidth so we decided we'd find out own way out of the country."

Ihug approached Judith Speight, head of the local branch of SITA, which provided international links for travel companies and airlines. It just happened to have a frame-relay connection direct to the United States. Ihug had always wanted a fixed price for bandwidth so it could charge a fixed price to its customers. The SITA frame-relay offering was a chance to review that option. "We convinced them to let us have a 128kbit/sec frame relay connection to Los Angeles at US$12,000 a month. Then we had our own router installed in the US and purchased a second router from another US carrier which terminated the capacity into the wider Internet. That was our first fixed cost price."

In November 1995, a year after Ihug launched, stiff new competition arrived in the form of Voyager with the full backing of Australia's largest ISP, OzEmail. It also had independent international access, a simple Windows-based CD that sped up the process of setting up an account and an 0800 number that meant for the first time there was nationwide free calling access.

Anticipating Voyager's launch, Ihug jumped in with the flat-rate charging it had been working on, making a big splash at the Computerworld Expo with its Diamond Account, costing only $44 a month. Voyager countered with a low-entry level and the ISP market was forced into the first of many rounds of price cuts that quickly took their toll on smaller players already operating on low profit margins.

Ihug believed it had enough customers to support the new business model and began an all-out marketing campaign. At first competitors, including several newcomers, looked on stunned at this new approach, refusing to believe it could work. Until now this had still been something of a hobbyist's game, an area that required technical expertise. No ISP had undertaken a major marketing campaign before. Wood said most of the people running ISPs were highly technical and not very focused on the dollars-and-cents side. "We had a good blend of technical capabilities and were also thinking of the business and customer side of the service and what people wanted."

Marketing also meant market research. According to Nick Wood there was global evidence that "guys took up the Internet ahead of their wives or women in general." They were using it at night and hogging the phone line. "Their wives were bitching in their ears about how much money they were spending on the Internet, or how much time they were spending on line. Most people didn't understand what a megabyte was, or how quickly they would use it and end up with a $300 bill at the end of the month." With Ihug's flat-rate customers at last had some certainty about cost. "We thought if we fixed the price they could say, 'it's only $40-$50 a month' then the pressure would be relieved to some degree. It gave them a clear picture of what it was going to cost. It created a momentum. We had a huge increase in uptake of customers."

Craig Whitmore said flat rate came as a great relief to many users who had become addicted to Internet use and were clocking up bills of hundreds of dollars each month. "I remember over a year manually adding around 50-60 customers a day and at peak times it would get really busy and people couldn't get on-line. If you managed to get on at peak time you tried to stay on for as long as you could without getting logged off. We had trouble keeping up with the number of customers."

Competition among ISPs changed dramatically in May 1996 with the entrance of Xtra, a business unit of Telecom, which was immediately in a commanding position through its access to every town and city and its huge marketing ability. Voyager increased its investment in technology and dropped its prices further.[6] Xtra's high-handed, commercially driven approach, however, offended many of the old guard who remained loyal to the smaller ISPs despite the offers of cheaper access.

Ihug grew substantially during this period; its flat-rate services and its independent international bandwidth setting it apart. While Xtra was snapping up hoards of new customers, those who understood something about megabyte or time-charging and were looking at downloading larger files or spending longer on-line, were attracted to the surety of monthly costs. Ihug's success allowed it to continue investing in new ideas and keeping ahead of market demands.

During the first access price wars, the cost of computer hardware and modems had begun to fall and the Internet itself was gaining global momentum. "Our main problem became infrastructure. Telecom was only delivering services on copper pairs and there were only so many you could have in certain locations. You had to have scripts that ran through all the phone numbers to find a free line so it was quite complicated. Initially you had a script that meant someone would dial across 500 lines until it found one that was free," said Whitmore.

The mid-1996 solution to relieve that congestion was to deploy Ascend Max 4000 hubs, which could deliver 30 numbers on one line through primary rate ISDN. The cost, though, was around $108,000 each. "We used to laugh and point at three of them in a cabinet and say to someone, 'There's your house' and they were only the size of a PC. The price ended up coming down substantially over time." While having the Ascend boxes should have solved the problems, Telecom's software at its exchanges wasn't smart enough to link the lines together, so there was still a need for a script to dial a series of numbers to find an available line.

As Ihug expanded its coverage down the country to Hamilton and Wellington and into the South Island it found common goals with Efficient Software, which had coverage from Dunedin down to Invercargill and across to Queenstown with about 4000 customers. Owner Bart Kindt, a Dutchman with a strong technical and engineering bent, agreed to a merger with Ihug for a 10 percent share of the growing business.[7] Kindt moved to Auckland to work with the Woods on strengthening their local network to cope with the growth and help them with an expansion plan into Australia.

The pressure was also coming on from SITA, which realised that Ihug was taking up so much of its backbone capacity into the United States it couldn't afford to maintain the relationship. Nick Wood said through quick thinking they leveraged Telstra, which had just entered the market, against Telecom. "We stretched the truth a little and Telecom, not wanting to be beaten out, eventually matched Telstra's offer. We ended up with a reasonable level of pricing for the capacity in and out of the country." Not happy with that Ihug pushed the boundaries further in its search for alternative international capacity and redundancy.

It was aware the PacRim East undersea cable was running out of capacity and began looking at ways to run at faster-than-dial-up connections. "We had found some hardware in Europe that would deliver us a solution off the satellite, and it also looked like it could also deliver us a backbone solution. We could have two satellites from America delivering capacity into New Zealand but you couldn't go back the other way. Because most of the data was coming into the country from the US you could however use the copper for up-stream," said Nick Wood.

In 1997 The Internet Group (TIG) Ihug became the first New Zealand ISP to cross the Tasman, creating a beachhead in Australia with services in Sydney and Melbourne, Brisbane, and Adelaide. It established two 34Mbit/sec feeds coming from the Napa Valley transmitting up to PanAmSat and down-to-earth stations in Auckland, Sydney, Melbourne, Wellington, Christchurch, and Dunedin.

Around 85 percent of its Internet traffic came in via satellite plus there were redundancy links. The company used PanAmSat's PAS-2 satellite to provide Internet services to the United States through the T1 circuit across the Pacific and was supplying a number of Australian ISPs capacity on its satellite link.

This new model with high capacity feed to uplink stations and normal landlines for the return path required an equipment upgrade; Unix servers with Pentium PCs running Linux for minor league stuff and Axle hardware for major services running Solaris 2.5. The main site Web server was running on Silicon Graphics machines and customers' home pages were served from an Axle machine in Napa Valley. An Internet outsourcing service for corporate customers was launched in 1998.

Locally Ihug launched its StarNet services in October 1997, serving Auckland customers via a microwave link from the Sky Tower. It offered download speeds between 256kbit/sec and 2Mbit/sec, something unheard of for Internet access. This was expanded via satellite during 1998. Performance, however, depended on a lot of things, including cloud cover, rain density, and waving trees that might be in the path. Line-of-sight connections with the Sky Tower or a major transmission point guaranteed a strong signal but direct satellite links requiring a much larger dish were less reliable.

Sales were booming and Ihug continued to be surprised that none of the other ISPs had followed it with flat-rate accounts. Few were even advertising their services, which gave the company a distinct edge. By 1998 it had 70 staff on board. The journey to success had been dependent on entrepreneurialism and good timing. There had been no major outside investment other than their father John Wood's initial investment of $8000 followed a little later with a $10,000 top-up. Apart from that, growth was funded through profit.[8] In July 1999 Ihug had become New Zealand's second-largest ISP, with 65,000 customers both locally and in Australia, with a staff of 200. Annual turnover had risen from zero to $30 million. The *National Business Review* (NBR) in its annual Rich List estimated the Wood brother's, Tim, 30 and Nick, 32, combined wealth at $75 million.

It had been evident for a couple of years that the Internet in New Zealand was entering a new era. Perhaps it was the end of innocence or the inevitable outcome of commercialising. At one end the World Wide Web was maturing to the point where businesses could see the possibilities of doing much more than creating electronic pamphlets to showcase their wares. They could be as up to date on global trends and information as anyone, and email was so widespread now that it was being used for business transactions.

New Zealand felt a little less isolated because of this growing connectedness, which in turn meant that companies were requiring much more from their ISPs, who in turn required much more from their bandwidth suppliers. Being in the ISP business was no longer something for the hobbyists; you needed ongoing investment and growth. The market was becoming highly competitive, and for the first time ISPs began to advertise their services rather than relying on word of mouth.

VOYAGER RUNS RINGS

Voyager launched in November 1995 as New Zealand's first truly national ISP with nodes in Auckland, Hamilton, Napier, Wellington, Christchurch, and Dunedin and free 0800 access to users outside the node cities. It was the first time everyone could get Internet access without incurring toll charges or Pacnet expenses. While it was greeted by stiff competition from day one, particularly from Ihug which launched 'all you can eat,' flat-rate dial-up accounts in the same month, it quickly outperformed all challengers. Voyager claims it was the 42nd ISP to start business in New Zealand but within ten weeks of launching it was the largest of all.

CEO John O'Hara had earlier set up Hargon International, a large local distributor of floppy disks for businesses. When a couple of his workers left to set up OzEmail they approached him to head the New Zealand operation. Initially he declined, then at an industry conference in Boston he had an epiphany. "Everything I saw said the Internet was going to be big so I had to change my mind."

O'Hara wasn't new to the on-line world. He'd been running a forum called Go Kiwi on CompuServe, promoting New Zealand software businesses. While he had his CompuServe access address on his business card it was mostly viewed as a curiosity. Hardly anyone had Internet or on-line addresses in their promotional material. Fax was still king.

John O'Hara founder of the Voyager ISP which gave Xtra and Clear a run for their money in 1996.

Of course when you're starting a new business a good name is essential but O'Hara and his business partner and technical manager Alistair Stevens were having difficulty. All the logical extensions link... email and Kiwi had been taken. "My wife was looking along the row of *National Geographic* magazines at home and said, 'What about Voyager?' We looked at each other and said, 'That'll do.'"

Chris Barton in New Zealand's *PC Magazine* explained: "Voyager company director John O'Hara is aiming high. He wants Voyager to be 'the biggest and the best' Internet service in New Zealand. 'We hope we can help them to have a Grand Tour' says O'Hara, an oblique reference to the 1970s Voyager spacecraft mission developed by the NASA Jet Propulsion Laboratory. The mission was born of a concept known as 'The Grand Tour,' to take advantage of a geometric arrangement of the outer planets – Jupiter, Saturn, Uranus and Neptune – which occurs about every 176 years."

O'Hara was also acutely aware the Internet still had a bad reputation for being difficult to use. Even getting signed up was enough to trigger bouts of technophobia. So he and his team developed Voyager Wizard on a floppy disk to bypass a lot of the geek stuff. Ihug had already found the approach worked wonders for them so it wasn't a new idea. Voyager's Windows application included a licensed copy of the Shiva PPP Dialler, which auto-detected the modem in the user's PC. An on-screen map of New Zealand showed access nodes, and after clicking their location users could select the appropriate access number. Once connected they could download a licensed copy of Netscape Navigator and further Internet software. Voyager offered unlimited technical support and customer service via toll-free 0800 numbers from 9 a.m. to midnight seven days a week. It also provided permanent Internet connectivity via leased lines to high-use customers. Users were charged on an hourly rate rounded up to the next minute. There was no charge for volume and no fixed monthly fee. Rates were $10 an hour.[9]

Unlike most ISPs, Voyager bypassed the Waikato gateway with traffic sent through OzEmail and Aarnet in Australia, via a high-bandwidth data circuit across the Tasman. The company initially contacted Telecom about providing New Zealand backbone services but O'Hara's friend Phil Norman advised against it, as he was about to head a rival Telecom ISP. Voyager went with Clear for its 0800 nationwide access. Several hundred Netcom 28.8kbit/sec modems were installed at about a dozen points of presence around the country, initially at Clear exchanges then regional points, mostly Dick Smith stores. Within six months of operation Voyager shifted to Telecom as its backbone provider, consolidating everything down to a single Auckland site with 0800 access. "They were cost

WHEN THE DEMO DIED

One of the most notorious events in New Zealand Internet history occurred in 1995 just as competition in the ISP market was heating up, and the medium-sized players were making every effort to attract new users despite limited budgets.

New entrant Iprolink, formed in Auckland by Napier Computer Systems in 1995 quickly shifted away from dial-up provision when it became clear the market was getting crowded. It began focusing on business-to-business (B2B) communications, establishing itself as a broker, consulting with clients to determine their needs and then bringing together the components and partners for an end-to-end solution.

Director Craig Anderson was running an Internet demo in the Auckland University Atrium, which was attracting considerable interest when the link back to its server began slowing down to the point that it almost fell over. Anderson was understandably frustrated and was convinced something out of the ordinary was ruining his demonstration of Internet capabilities, and with it, his company's reputation.

With assistance from Russell Fulton at Auckland University it was discovered a flood of ICMP (Internet Control Message Protocol)[11] packets were swamping Iprolink's data link, and seemed to be emanating from Cybernet, another customer of Auckland University. Steps were taken to block the traffic so the demonstration could continue. The university pressed Cybernet for an explanation. When there was no response a deadline was given with a threat of further action. Silence. The only comments from anyone at Cybernet came in reply to articles posted in the nz.general newsgroup stating the IP address responsible for the ICMP traffic was traced back to a machine controlled by Phillip Hardy, who allegedly had nothing to do with the management of Cybernet.

Cybernet management refused to accept any responsibility for the action. The only comments came in several newsgroup messages from Mark Craes, who identified himself as a manager with Cybernet, who in posting nz.general came out 'fighting and flaming.' In one message he personally attacked Anderson's motives for making the affair public, questioning its importance as "it was no more than an annoying prank." In November 1995 Cybernet was disconnected from Auckland University. Telecom removed its network terminating equipment (NTU) from the university the next day, but Cybernet was a short-time later reconnected to the Internet via Midland Internet Services.[12]

According to Don Stokes, operations manager at NetLink, it was the attack on iProlink that caused Auckland University to reconsider its options for providing Internet services to third parties, ultimately resulting in it handing over its operations to NetLink. Frank March concurred: "Within a few days of the incident, I went to Auckland to talk with Nevil Brownlee and information security officer Russell Fulton, to suggest NetLink could remove all the risks of such an operation. Auckland University was being threatened with law suits and they were really unhappy about the position they found themselves in."

competitive and generally came up with a better deal. The market had become very competitive by this stage," said O'Hara.

Things had remained fairly collegial between most ISPs but the tone changed noticeably at Telecom a month after Voyager had launched, and Phil Norman was replaced at the head of the new Internet Services Group (ISG) on-line business unit. American Chris Tyler had arrived in December 1995 bringing a management style not seen before at Telecom. According to one staff member he "had this vision that we were going to own the Web and we were going to tie up every Internet user." Tyler's main problem, said O'Hara, was that he was too aggressive and approached the market in a very confrontational fashion, polarising the other ISPs against him. "His approach did him more harm than good." So aggressive was Xtra's drive to build its customer base that Tyler reportedly considered buying out other ISPs at the rate of $200 per customer.[10]

TELECOM MAKES AGGRESSIVE ENTRY

Telecom was late to the Internet game. It had dismissed advice to get into the market much earlier and the warnings, when upstart hobbyists grew from being bulletin board providers to making serious inroads into what had traditionally been carrier space. What smarted even more was that its own joint venture, Netway Communications, was providing international bandwidth via the Waikato gateway to a number of the ISPs who were nibbling around the edges of its business.

Its first dip into Internet waters was NZ On-line, a joint venture with Taranaki Polytechnic, delivering a 'cut-down Internet access product' for schools and other special interest groups. This only served to show just how far behind the market Telecom was, as smaller ISPs quickly proved they were much more adept at delivering such services. Telecom announced in September 1994 that Netway itself would start providing retail Internet service to its existing customers but the service never launched. Then early in 1995 Telecom On-line Services (TOLS) was born, more as a research group than a business unit, and began conducting service trials. Business development manager, Phil Norman, announced his strategy for entry into the ISP market which would be different to Telecom's mainstream business.

He believed this new venture would prosper if it was allowed freedom to grow and make decisions quickly and act entrepreneurially. "Over time certain services should be pulled back into the mainstream organisation because of the tremendous ability that Telecom has for contact with just about every New Zealander." Norman admitted the Internet was a hard sell to some 'sceptical' people in Telecom, but scoping studies gave way to technical trials and discreet recruitment, including some of the first wave of local Web publishers.[13]

In December 1995 when Chris Tyler became general manager of Telecom's ISG, one of his first decisions was to acquire Brisbane-based multimedia company Digital Video Productions (DVP), to create Xtra's branding and design a Web presence. He claimed this new company would be at the core of a new media business soon to employ hundreds of skilled staff.

Xtra was officially launched at a function on 1 May 1996 at Kermadec restaurant in downtown, Auckland. It was alleged in a number of media stories that Telecom spent NZ$9 million to start Xtra and there were predictions it would be operating at a profit within one year. However as customers flocked to the new service they discovered the front page to its Web, the cumbersome 'X-ville' township graphic[14] weighing 135kb, took longer to load on-screen than just about any other page they had encountered. Most people still had 14.4kbit/sec modems and many were still on accounts where you paid for local traffic. The highly graphical first impressions backfired on all counts. The enormous image also acted as something of a wall between Xtra and all the content DVP had developed behind the scenes.

Communications Minister Maurice Williamson presents journalist Russell Brown with his TUANZ Journalist of the Year Award in 1995.
TUANZ Archive.

Behind its portal were community interest areas, a shopping mall as well as news, sports, weather, children's and teen content. The site also offered a jump off to Telecom's 18 telephone books on-line. DV quickly cobbled together alternative Web entrances for low bandwidth users, but still users had to click through to each specified section and click again to see any content. There was no way of easily showcasing new content; the front page just stayed the same.

Journalist Russell Brown said content developer DVP entered the frame through its relationship with another Telecom Australian asset, the IT and telecommunications company Pacific Star. "They made quite a pair. PacStar designed and installed the billing and security system behind Xtra, an infrastructure that Tyler told the press would be good for the first 50,000 customers. But the PacStar system started double and triple-billing customers, or not billing them at all. Billing records got so out of hand some were simply dumped. Almost every other ISP had billing problems at the time, but Telecom had been expected to get it right. Within six months, PacStar's system was replaced at considerable expense by Technology Applications' IPAC 9000, a turnkey solution from the US."

Xtra did not signal its relationship with Telecom in advertisements and news announcements. However staff were located within Telecom buildings and had access to Telecom management staff. The Xtra technical staff also had unfettered physical access to the Telecom network for installing, testing, and maintaining their own equipment. Most importantly, Telecom was funding the venture and seemed to have an open-ended timeline for success. Its stated goal was to obtain 50 percent of all new Internet users. In fact, during the rest of 1996, Internet connections grew at a rate of 17 percent per month.[15] Xtra set-up fees were much lower than those of many competitors. It charged on a time basis rather than by usage (Mbytes), thereby making it easier for users to estimate charges. Internet charges were included on the telephone bill, allowing users to make one payment for all Telecom services, and its connection package was tailored to the inexperienced computer user.[16]

According to the Internet Hall of Shame, Alan Marston of Auckland PlaNet applied to Telecom for the 0800 PLANET number in July 1996. After some deliberation his account manager informed him the name had been reserved and was unavailable. Marston, despite every effort, couldn't find out who had reserved the name or why. Then in September Telecom began running spacey TV ads with a UFO slowly casting its shadow over the earth, scaring herds of animals that stampeded in panic. The UFO stopped and a bright beam of light illuminated a large circle from which arose a message that Telecom had 'a new lower cost' scheme for calling anywhere on the planet. The number to call for more information? You guessed it: 0800 PLANET.

Shortly after the first ad appeared Marston began to get phone calls from people enquiring about the new scheme. Then the trickle of calls turned into a stream, then a torrent. It was a weekend so he had to wait until Monday to get a response from Telecom. Apparently nobody

had told the Telecom operators about the 0800 PLANET campaign so they looked up PlaNet and redirected all calls to the Auckland ISP's enquiries number. Of course the cost of the 0800 calls was also put on the PlaNet bill. Marston's Telecom account manager duly sorted out the billing problem, and Marston was convinced he'd been given the 0800 number by default. No, said Telecom, the number was allocated to it by a dealer, and Telecom had the rights to it so it could not be reallocated.[17]

PRICE WARS GET SERIOUS

In anticipation of Xtra's launch, Voyager had announced its intention to add additional points of presence to supplement the six already operating around the country. This would increase the number of customers who could access the service via a free local call. Voyager also announced its intention to purchase additional servers. Soon after the launch of Xtra, however, it had problems with fast-growing customer numbers, resulting in complaints of slow service and inability to fulfil customer requests. Rumours circulated in the press that Voyager was slow paying Telecom for wholesale services. Voyager even cut its 0800 number briefly in a dispute with Telecom. Xtra also had significant problems providing service, and there was negative press regarding technical help, ability to connect, and service outages.[18]

From mid-1996 the major ISPs were engaged in an all-out battle for new customers. In May Voyager halved its hourly rate to $5, and in August Xtra halved its hourly rate to $2.50 and, more controversially, dropped its 0800 rates from $4.95 to $2.45 an hour, a lower rate than any other Telecom customer could get. Xtra now had 10,000 customers, and the price wars were starting to take their toll on smaller ISPs with rates down to $1.50 per megabyte and 50 cents for local traffic. Voyager, which had previously been market leader, was a significant loser in the price wars. Its market share dropped from 38 percent to 22 percent. It was unable to meet the new pricing regime due to its cost structure, which it complained was largely dictated by Telecom, from whom it purchased bandwidth and its 0800 service.

Many smaller regional ISPs complained they were unable to compete, and 19 of the 80 ISPs in operation around the country were forced out of business. The Internet Service Providers Association (ISPANZ) was formed to represent the interests of ISPs and their customers, largely in response to Xtra's price cuts. Most ISPs joined but Xtra refused to be part of the group. In September the Commerce Commission agreed to investigate complaints against Xtra from Voyager and others. IBM and CompuServe didn't even try to compete with that new benchmark and began to lose customers. The cheap international bandwidth of these previously big players was no longer enough to keep their edge in the face of this new level of competitive behaviour. The high cost of a national presence meant they soon became insignificant.[19]

The following advertisement was run on the 30th of August 1996 in the following publications by the following ISPs:

- *National Business Review* (Voyager)
- *The Dominion* (Actrix)
- *The Christchurch Press* (PLC)
- *The Independent* (ProLink)
- *The Evening Post* (Actrix)

Meanwhile there were serious problems with Telecom's network, and it was now obvious Xtra was adding customers it could not service. Customers from the larger ISPs, Ihug, and Xtra, were

dialling in to the newly launched Ascend Max 4000 hub, which in turn connected to exchanges through primary rate ISDN circuits, rather than conventional analogue phone lines. By September 2006 there was chaos. Telecom had not anticipated such a demand for digital services; Ihug and Xtra had booked all new ISDN lines out of Auckland's Mayoral Drive exchange until the following March. Neither could add enough dial-in lines to keep pace with customer growth.

And a bug in Telecom's exchange switches meant only 30 lines could be assigned to any dial-in number. Both ISPs, who were running hundreds of lines, had to issue dozens of different numbers to customers. Xtra customers, who had numbers preconfigured in set-up packs, got busy tones for hours, while lines relating to other numbers were idle. It was a shambles. Ihug briefly stopped accepting new accounts. Xtra briefly stopped advertising.[20]

Newsgroups: nz.comp,nz.general
Date: 4 Oct 1996 03:57:47 GMT
… I must admit I often laugh to myself when I think of Telecom and the Internet as it reminds me of the article in the Dominion on Monday September 19 1994 by Mr Zwimpfer stating so positively that the Internet was not for Telecom and could never be a success. Now Telecom are scrambling to take it over as they see it as the biggest threat there is to there dominance in the future communications market.

So now we see Telecom rushing to get out there and take over all it can before its competitor Clear can get out there... yet the plan is falling around Telecom's ears as the service seems to be falling to bits all over the place with security issues, network problems and now we cannot stop hearing about access problems with a network that has only 15,000 users but was designed for 50,000. Of course Telecom's media machine is doing its best to counter the actuality and severity of the problems but few people in the industry are fooled by it. Better to be honest and admit problems when they arise and get them sorted rather than

being dishonest with your customer. The Internet is a different world to the telecommunications that Telecom is used to… one cannot continue to fool your customers all the time.
John Vorstermans, Actrix Networks

Industry commentator and Aardvark Webmaster Bruce Simpson in his inaugural Aardvark Awards presented the "I Can't Believe It's True" Award to Xtra "for being reckless enough to drop their prices by more than 50 percent, while knowing full well they wouldn't have the capacity to handle the extra business." Simpson said Xtra was already ahead of its projected sales figures at the time and its actions simply appeared to be "motivated by greed and a need to unfairly dominate the market by squeezing the little guys." He said through halving its fees Xtra was not only guilty of 'overtrading' but had unnecessarily devastated the profitability of the smaller players in the marketplace.[21]

The Commerce Commission cleared Telecom of cross-subsidising its Xtra Internet service late in 1996. After price cuts by Xtra earlier in the year the Commission had received 15 complaints. These alleged Telecom was charging less for providing 0800 access to Xtra than to other ISPs, that competitors were being denied access to the new IPNet access service and that Telecom was deliberately running Xtra at a loss to drive others out of the market.

The Commission found Xtra and other ISPs were paying the same rate for 0800 services and that IPNet was still at trial stage. However Commission chairman Alan Bollard said he would still look into whether Xtra's losses for its first years of operation were a legitimate investment to gain a foothold in the market or anti-competitive. He was concerned at Xtra's below-cost pricing, which could be considered a breach of section 36 of the Commerce Act if used by a dominant player to drive competitors to the wall.[22]

The bad feeling between Xtra and Voyager continued, and there seemed to be no end to the bag of dirty tricks both sides were prepared to dig into. Broadcaster, columnist, and IT journalist Russell Brown wrote in *Unlimited* magazine in 1998 that "the great Xtra security debacle (was) an episode in New Zealand's Internet story from which nobody emerges with much credit." It began in late September 1996 when John O'Hara, general manager of Voyager, got a phone call from someone at another ISP who said he could access the email of any Xtra customer. O'Hara and his partner Alistair Stevens drove to the man's home to witness a startling security flaw.

On registration, all Xtra customers were able to choose their own 'Xtra ID' to be used in their email address – jack@xtra.co.nz. The name was an alias for a numerical log-in the PacStar system assigned to new customers, along with a password. O'Hara's informant discovered that the letters in Xtra's passwords directly corresponded to the numbers in its log-ins – for example, the password for xtr188772 was wppqqv. By any security standard, it was pathetic.

The ISPANZ steering group talked by phone and decided to advise Xtra ASAP, said O'Hara. "We called and Chris would not take the call. We then faxed them and asked for a response within 30 minutes. There was no reply so we went public with the fact it could be done but did not say how." To discover passwords, it was necessary to know a customer's Xtra log-in, and not just an email address. There would have been no practical way of finding log-ins had Xtra not inexplicably left open an old Internet utility on its system called Finger. This meant anyone who ran Finger on an Xtra email address would be provided with that customer's numerical Xtra log-in.

Xtra management went into panic mode, shutting the service down, without telling staff what was wrong. Customers were offered the chance to change their passwords on-line without being told their security might already have been compromised. Indeed, a malicious attacker could have used the facility to lock people out of their accounts by changing their passwords. Within days Xtra had couriered new registration packs to 10,000 customers. Yet a press release headed 'Telecom

rejects anti-Xtra lobby claims' insisted "the fact of the matter is that Xtra's security procedures are robust," and the press was directed to a security consultant who confirmed this. He later admitted he had been unaware of the problem at the time he was quoted.

Meanwhile Voyager staff had done more than Finger one or two addresses. They identified every possible Xtra ID between xtr000001 and xtr999999 – thus compiling an email database of all Xtra customers. O'Hara emailed every one, offering information about the security gaffe and the chance to transfer to Voyager. It was an unacceptable act of spamming, and even industry body ISPANZ issued a public rebuke. Xtra might have enjoyed the moral high ground for a little longer, had not Tyler returned from a sales tour to the United States and issued a press release headed 'Voyager nabbed!' demanding it destroy its database. Then, without warning, he ordered all traffic between Xtra and Voyager blocked – to hell with Xtra customers who might have been waiting for email from friends at Voyager. It was Internet heresy.

"I would say that I am absolutely surprised and disappointed in the way that the media have worked very hard to try and turn this into an Oprah Winfrey-type event," Tyler whinged to *Computerworld* shortly after the block was lifted, insisting the security problem was "a tremendously overblown identification of a weakness that we had in the service." Suspicion of the press and a hatred of O'Hara had become something of a culture at Xtra, said a staff member. "Whenever anything came out in the press bagging Xtra, it was just down-tools and how the hell do we counter this. But they never seemed to take advice on board. It was 'we'll do it our way and destroy the bastards.'"[23]

Xtra had a strict corporate information policy forbidding staff from talking to the press. O'Hara, however, maintained a good relationship with the press, even after a number of critical stories about Voyager. He dropped enough hints about the security gaffe for journalists to piece together the story. This made him all the more reviled at Xtra. In the wake of the Finger furore, a young and over-emotional Xtra employee made threats to O'Hara and his family.

"There was this thick guy who sent me an email threatening to come around to my house and sort out my family. He tried to disguise his email address. But Alistair, as a technical guru, quickly found out it was lenny@xtra so I just rang the Xtra office, asked for Lenny and they put me through. I said 'Hi Lenny this is John O'Hara from Voyager.' There was this long silence. I said 'Listen, Lenny, mate, the police are on their way to see you so don't leave your desk.' And he confessed and apologised. Threatening my family was just going too far."

The man was interviewed and warned by police, but Xtra insisted no wrong had been done. Tyler told *Computerworld* the employee was "a particularly high-quality human being." The same man proved also to have posted abusive messages to chat channels while posing as an IDG (publisher of *Computerworld* and *PC World*) staff member, wrote Russell Brown.[24]

The way Voyager was set up initially meant local data was shunted across to Australia and then back again, which often meant much slower traffic in New Zealand. The use of proxy servers helped improve the performance of popular offshore web sites. In December 1996 it adopted routing to local sites through the Waikato NZIX gateway, which also helped speed things up.[25] Voyager was also trying to balance out the network load. "Most of our retail customers were dialling up during the evening and for a start the pipes were fairly empty during the day. I recall moving a lot of X-ray images and graphical data around within the health system and a lot of banking and real estate information during the day," said O'Hara.

CLEAR MAKES AN ENTRANCE

Clear Communications, New Zealand's second telecommunications service provider, entered the ISP market six months after Xtra's launch. It invested $8 million, establishing 15 points of presence for

ClearNet,[26] which like Xtra before it had the full resources of its parent behind it.

There was, however, much less fanfare: it would primarily offer services to existing customers, most of them businesses. In 1997 it delved even deeper into business needs, delivering value-added services such as web site hosting and high-speed data. ClearNet's pricing was based on peak demand times. At $5.95 per hour, its 0800-access was unable to compete with Xtra, but did still manage to capture about 17 percent of the market, and maintain this for some time. It targeted large users, mainly in the CBDs with Internet services and initially focused only on Auckland with its residential Internet business.

Clear carefully avoided being embroiled in the Commerce Commission complaint instigated by Voyager, by pitching its price at a dollar more than Xtra's. The ISP wars heightened and while it was unable to match Xtra's marketing budget, arch-rival Voyager could at least keep milking the divide-and-conquer strategy. There even appeared to be some sympathy for Voyager within Xtra, particularly from sales and technical people. Voyager director John O'Hara remembers being contacted by a commercial person from Telecom with an interesting offer.

"He said, 'I've got the 0800 number you want.'

I went, 'Yeah, what 0800 number is that?'

'You know, 0800 BUY EXTRA.'

I said, 'Oh, that one… okay, great. Remind me why I want that?'

'Well, 0800 BUY XTRA is Xtra's one. So we just thought you'd like EXTRA.'

"Absolutely, yes we would.'

So we took it, at their suggestion, and started getting 100 calls a week from that phone number."

In December 1996 Telecom hit back, demanding Voyager give up the number or face court action. It stated in a letter that it had the right to withdraw any number and replace it with another, and threatened litigation if Voyager didn't relinquish the number voluntarily.[27] Voyager's marketing manager Phil Dagger, however, responded that the word number not only spelled BUY EXTRA, but also BUY FXVOYAGER and was being used to promote its new Fax by Internet service. Dagger said Voyager had asked for BUY-FAX but been told by Telecom it was reserved.[28]

Then came a further round of legal exchanges in the form of a warning from Voyager that Xtra should stop using the Voyager catchphrase 'Discover the Internet.' Voyager said it had been using the phrase since November 1995 and it was a part of its image and branding, and Xtra was confusing the market. It wrote to Xtra asking for withdrawal of all material using the phrase. Many, however, saw the exchange as another episode in the now long-running list of spats between the two rivals.[29]

Ron Woodrow, the managing director of Iconz, also tried to capitalise on the natural inclination to misspell the Telecom flagship's name, by registering the domain www.extra.co.nz. He received 100 emails during the marketing campaign. After the fun had gone out of the prank O'Hara rang Chris Tyler to fess up about the business he'd been getting at Xtra's expense. "He was just his usual mad dog self. He went completely off the deep end and took our marketing manager to court. We ran for two to three months then relinquished the number." O'Hara insisted that if Telecom had played it a bit straighter with the market and had a wholesale and resale business everyone would have been better off. That first year of operations for Voyager was, 'a ride and a half.'

In March 1997 another marketing ploy from Xtra backfired. A CD-Rom to make it easier to sign up to Xtra was widely distributed to Telecom customers. It came preconfigured with Netscape's Web browser and other programs which would load onto the recipient's PC. If unsuspecting customers loaded it, then decided they'd prefer to stick with their existing provider, the problem became evident. What existing provider? The CD had written over any existing browser software, along with any configuration details to any other ISP.

In one innovative effort to turn that campaign on its ear Peter Belt, business manager for Auckland ISP Web World, sent out his own promotional material as part of the 'Xtra – Just say no' campaign, offering $5 credit on its service if people handed in Xtra CDs. "The idea came to us when we were kidding around how I now own an Xtra CD which is being used as a coaster for my coffee mug. The joke was that I somehow keep the real perks for myself, and am not eager to share them with my colleagues." The basic idea of how we could get more CDs for the rest of the staff started out as a joke, but became a promotional and cost-saving opportunity.

Don Campbell, Web World's support manager, reported to the management team that since Xtra's aggressive promotion customers had let their curiosity get the better of them and had their software overwritten. This has caused an extremely unwelcome load on the support people. "The ISP industry repeatedly expressed its distaste for the CD ploy, some even going as far as labelling it as nothing less than a 'commercial virus.' In Belt's view, Xtra had declared war on the industry. "I can only think that our response to the latest campaign is one of the more creative seen in recent times, and would like to see it repeated around the country."[30] The same day Web World's comments were published, 18 March 1997, the Advertising Standards Complaints Board upheld a complaint that Telecom did not supply the 'fast, reliable' service it advertised. Xtra offered toll-free help desk support from 7 a.m. to 11 p.m. but it was clear this was not available as claimed.[31]

Voyager had pioneered a number of services including 0800 nationwide access, launched its own Anzwers search engine, a fax over the Internet service, and even voice over the Internet as part of its business bundle, although the latter received little patronage. It had done extremely well for a small business but as the market became more crowded, demands from its owner OzEmail to increase customer numbers and profitability were putting the squeeze on Voyager. OzEmail's original idea was to create a regional grouping of ISPs with New Zealand as the first. Then it set up shop in Malaysia and India and listed on the US Stock Exchange. Involving 80 percent owned Voyager in the US listing process, however, involved a lot of drama. "The focus changed from building a regional ISP network to running a profitable business and there was a lot of pressure from American investors about getting the numbers of business customers up." O'Hara and his partner were losing interest and began negotiating their way out.

At the end of May 1997 the Commerce Commission announced a not-guilty verdict following complaints from Voyager that Xtra was engaging in predatory pricing. Voyager's new general manager David Mackey said that the findings were 'no surprise' and wouldn't affect Voyager's intention to pursue the matter through the courts later in the year. The Commission found that Telecom did not appear to be using a dominant position to harm competitors and was simply using every incentive to keep its access prices as low as possible to encourage the market to expand more rapidly. And the competitive process in the relevant markets was less likely to be harmed now that Clear had arrived, and Telstra had announced it would also be entering the market.[32]

OzEmail finally bought out the 20 percent of the Voyager shares held by John O'Hara and Alistair Stevens in September 1997. When the Australian company decided to pull the plug on the local operation two years later it ironically signed a deal with Xtra to take over the bulk of its customer base.[33]

IN SEARCH OF MEANINGFUL MEASUREMENT

Internet numbers veered wildly across the graph locally and internationally during the peak years of 1995–1998.

Long-time IT journalist Chris Barton found himself scratching his head trying

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to make sense of all the variables. Were there 7 million active Internet users worldwide in 1996 as indicated by O'Reilly and Associates, or was it more like the 26.4 million that Matrix Information Services Directory suggested?

Telecom estimated there were up to 120,000 New Zealand Internet users six months before it launched its service in May 1996. Research company IDC New Zealand estimated 34,000 people had access to the Internet via ISPs accounts while the Ministry of Commerce, based on March 1996 IT statistics derived from Network Wizard's Web Walker software, claimed New Zealand had 53,610 hosts or computers and servers permanently connected to the Internet. In the same paper, Victoria University researcher Mark Davies counted 3078 registered domains.

AGB McNair through its Internet Research Service said 25 percent of New Zealanders over the age of ten had access to the Internet through home, work, school, or university, and 14 percent had physically accessed the Internet in the past 12 months when it surveyed the market in January 1996. Users were mainly browsing and exploring, searching for information, emailing, or involved in interactive discussions and newsgroup chat.

While it was difficult to establish a meaningful measurement, the overall data did give the first real glimpse of the multifaceted nature of the local Internet. The varying surveys used different methodologies. Network Wizards data was gathered from domain name system (DNS) entries and pre-DNS host tables and AGB McNair's survey was conducted as part of the company's regular readership surveys to 12,000 respondents. IDC's research was based on a phone survey of 35 ISPs asking how many subscribers each had. The 34,000 total it came up with didn't differentiate between home and business users or account for multiple users from corporate, government, tertiary education, and schools sites.

Evidence gleaned from on-line lists of Internet access providers suggested there were around 45 ISPs in New Zealand and possibly more like 45,000 dial-up subscribers. IDC's survey found that 79 percent of ISPs in New Zealand had been operating for less than one year and 29 percent of those had nationwide coverage.

IDC also expected 85,000 modems would be sold in New Zealand in 1996 (compared to 55,000 in 1995), taking the installed base of modems in use in New Zealand to 144,000. The installed base of PCs at the end of 1995 was 804,000 and expected to climb to 947,000 by the end of 1996. The research also indicated there were 238,000 home consumer PCs and an additional 30,000 home-business PCs at the end of 1995. The figure tallied reasonably well with the annual Household Survey conducted by Statistics New Zealand in March 1995, which claimed 21.7 percent of New Zealand's 1 million-plus households had a computer. What remained unclear was how many had a modem attached.

The Ministry of Commerce research paper put it in plain language: "To be counted as host, a computer must have its own Internet address, and be permanently and directly connected to the Internet." Dial-up users were excluded from this count. So did that mean there were 53,610 Internet users in New Zealand? Yes and no. It's

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reasonable to assume there is at least one user for every host. But it's also reasonable to guess there are quite a lot more, said Barton.

In fact during 1994 the Internet in New Zealand didn't just double in size; it grew much faster than in the rest of the world. An accelerating annual growth in registered domain names of 180–250 percent tells a similar story about the number of organisations connecting to the Internet. A Victoria University survey assumed each top level New Zealand domain (i.e. 'name.'co.nz) belongs to a separate organisation. The 1996 count suggested 3078 organisations were connected but there was no telling what was behind the domain. Some companies simply reserved domains for future use.

AGB McNair conducted an on-line Surf Check survey in November 1995 with 1009 respondents. It provided a small profile view of Internet users and their habits. Of the respondents 87 percent were male, 64 percent aged 20–39, with an average income of $45,791 with 24 percent coming from the business and financial sector and 22 percent from the community and social services sector. On average they accessed the Web 24 hours a month and spent most of their time on industry information, entertainment and media, and company and product support pages. They tended to shun on-line shopping and personal home pages. They also rated speed of access as the Internet's weakest feature. Ease of access through ISPs, the variety and usefulness of information, along with entertainment value all rated highly.[34]

Infotech Weekly, the technology pages of the Wellington's *Dominion*, quoted some interesting figures in the first week of December 1996. Data sourced mainly from AGB McNair suggested only one in five people in New Zealand had even heard of the Internet. Then came the confusing revelation that 188,000 people had used the Internet in the previous month and that there were 300,000 'regular' users. Aardvark's Bruce Simpson asked if there were 300,000 regular users, why was the total number of dial-up ISP accounts estimated at no more than 50,000?

Two and a half years after his attempt at discerning Internet numbers from the wildly ranging statistics of mid-1996, Chris Barton, writing in the *New Zealand Herald*, again confronts the figures in his article 'Whatever your pick on surveys, the Net is big' on 15 December 1998. There was still confusion but a much clearer picture was emerging about who was using the Internet, through which provider and why.

IDC had pitched 315,020 as the number of Internet subscribers in New Zealand while AC Nielsen's NetWatch survey for the third quarter suggested it might be as high as 741,000, with 24 percent of the population aged ten and over having used the Internet in the previous month. Barton suggested both had an element of truth. IDC's figures came directly from ISPs and indicate the number of billing accounts, many of which represented businesses and were used by multiple employees.

"Even so, with about 60 ISPs in New Zealand, IDC figures fell short of claims by the leading ISPs: Xtra (150,000), ClearNet (70,000), Ihug (about 60,000) and Voyager (28,000). Not far behind were Iconz, CompuServe and Iprolink – and then a string of smaller companies. On those numbers 400,000 accounts would seem a better guess." Barton

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said the difference in the numbers may be explained by rampant growth in the ISP market or by companies overstating their actual subscribers. "Both situations are probably true. Telecom Xtra appears to be putting on new subscribers at the rate of 10,000 per month, but also acknowledges a difference between customers with whom it has a 'billing relationship' (150,000) and those regularly using their accounts (123,000)."

IDC's figures were hardest to reconcile with AC Nielsen's numbers, when compared with the location used for accessing the Internet. "AC Nielsen says more than half (at least 380,000) are using the Internet from home. Compared with the third quarter of 1997, that's 100 percent growth. AC Nielsen extrapolates its numbers from 12,000 face-to-face interviews conducted as part of its readership surveys. It asks how many people have Internet access and comes up with a whopping 45 percent of the population aged ten and over. That includes those with access from home, work, places of education, via friends and relatives and libraries."

Barton wrote: "The survey also provides some insight into what Kiwis do on the Internet. Most (56 percent) say they're just surfing. But others regard it as a giant free encyclopaedia: 41 percent want information on products and services, while 34 percent look for information on companies and organisations; 31 percent seek news and current affairs. Travel information-seekers amount to 18 percent, and sports 17 percent. Eleven percent have purchased a product or service, while 25 percent use the Net to download software, 15 percent to play games and 14 percent to listen to music."[35]

Meanwhile Voyager had commissioned Colmar Brunton in October 1997 to survey the market to "get to the bottom of what was driving the Internet and learn about the consumer." In a press statement on 4 February 1998 it revealed that the Internet was still a new experience for most New Zealanders. The key findings, from a sample size of 115 people ranging from senior business managers to residential customers, suggested the experience could still be quite intimidating. "People do not feel confident using the Internet." It said 30 percent of connected businesses felt inexperienced and 25 percent of consumers felt lack of knowledge was a barrier.

Most people used the Internet for email (60 percent), but it was also being used as a marketing tool (20 percent) and for education (30 percent). It was also becoming increasingly popular for games (17 percent) and chat (12 percent). The report said consumers selected an ISP on the basis of price, first-time connection, fast network, and helpdesk support with price being more important to residential customers and reliable access more critical to business. "Generally consumers have low expectations of what an ISP offers. Many consumers feel that what might be considered basic ISP services (such as 24-hour technical support) are currently treated as additional services from an ISP perspective. Consequently in many cases ISPs are not meeting basic service needs."

Residential use was driven by the need for stimulation, fun and excitement while business use was founded on security. The research identified Voyager as the most preferred ISP for business (17 percent) ahead of Xtra (13 percent) and ClearNet (6 percent).[36]

WARNING: STEEP CURVE AHEAD

After two years of intense price competition the Internet market moved into a period of stability from the end of 1998. Most ISPs offered some type of data or voice service focused on business customers, competing directly with those of the telecommunications service providers and frequently undercut their prices. As marketing for these services grew, so did customer interest.

Christina Enright's thesis on the development of the market broke the players down into generalists and nichers:

The "generalists," or full service ISPs, including Xtra, ClearNet and Voyager were providing service to experienced and inexperienced users, high and low traffic users, and business and residential customers. They invested resources in personnel, advertising and technology to attract all customer types and placed more emphasis on business customers, possibly to seek greater margins. While Xtra and ClearNet had success using this strategy, Voyager, continued to lose market share… Its image as an innovator did not seem to have been sufficient to retain its market share in an increasingly price-competitive market.

The rest of the ISPs can be classified as market "nichers." These include Actrix, Iconz, Iprolink, NetLink, Ihug and all the smaller ISPs. Most of the regional ISPs maintained either a CBD or regional focus. For example, one ISP serving Palmerston North maintained a Web page advertising local events and the services of local businesses. These ISPs were often more expensive than Xtra but competed by meeting the needs of their local users. Some ISPs focused on specific interest groups, such as religious or environmental groups. Other companies such as NetLink, focused on the Internet and data communications needs of businesses, offering customers more options for consulting and technology. Ihug was the only regionally-based ISP to have pursued a national subscriber base and business outside of New Zealand.

In 1996, most ISPs had limited national coverage. Voyager had full national coverage because users outside a free call area could make use of a toll free number for an additional hourly fee, which was about twice the free call hourly rate. Xtra did not have full national coverage until 1998 but had the largest number of POPs (points of presence), meaning that a large percentage of potential users could access the service without toll charges.[37]

ISPs were offering a variety of account options from a flat rate, all-you-can-eat service at $40 a month from Ihug through to higher quality accounts with guaranteed throughput using a mix of time and data charges, costing $50–$150 a month. The reality was most of the 100 or so ISPs were still trying to become profitable. Newcomers such as Quick Internet, which arrived in 1998, further squeezed the evolving market, which was splitting into lower-tier budget players and more robust, sophisticated operators, who would eventually challenge traditional telephone companies with nationwide and international services.

Chris Miller, director of KiwiLink, said there was only one main reason Internet charging remained high in New Zealand. "It's in the hands of the one company with lines in the ground." Only Telecom could supply digital data circuits for ISPs and "they're about five times the price of what you can buy them in the US." While prices had reduced since mid-1996 he said it still had a long way to go, as did the prices ISPs paid for ISDN lines. Clear was beginning to provide links for ISPs in some areas and that had made some difference. Miller said KiwiLink used a time-and-volume basis for charging, which passed the cost on to the user and discouraged people surfing all day. All-day surfers on flat-rate accounts did a disservice to others and could also slow down other users who were signed with smaller providers.[38]

XTRA BLEEDS CASH

Telecom's wholesale business in international Internet bandwidth bounced back after a period where Telstra and Clear had beaten it to some serious business. In fact Telecom was doing a roaring trade, as business customers flocked to the Internet taking on leased lines and ISDN to gain faster access. Most home users could not afford ISDN, so many opted for second telephone lines. The one area the dominant carrier was still failing to get right though was Internet provision through its own provider, Xtra. After 30 months in the business there were serious doubts it had been able to turn a profit. So why, asked journalist Russell Brown, with all its marketing and technology clout, couldn't Xtra make money out of the Internet? He suggests Telecom got into the Internet initially because it was a threat and an opportunity, neither of which it was prepared for.

From the outset there was no shortage of people saying Telecom doesn't understand the Internet. A model of corporate culture, it was caught off balance by a phenomenal rush from the fringe. Its ridiculous home-shopping trial with the Auckland Savings Bank (ASB) (depending on special phones costing $1000 each) did not even use the Internet. A yen for content seemed quite logical back then when the local on-line market was dominated by CompuServe, which sold its customers not just connectivity but exclusive content and services. Elsewhere, America On-line's stock was rocketing and Apple Computer had its eWorld service. Most of all, Microsoft had positioned its own on-line service, Microsoft Network (MSN), as a key part of Windows 95. But eWorld died, CompuServe was split up and sold, and Microsoft spent three years getting the hell out of its original MSN strategy. Maybe content wasn't such a great idea after all?

Xtra's decision to get in the media business was creating its own problems. By hiring Auckland journalist Nigel Horrocks as managing editor it seemed to be signalling it was getting into the content business, despite assurances it would not be a content provider. Mixed signals were worrying to potential business partners like the *NBR*. From mid-1995 Telecom staff had extensive discussions with *NBR*. Eventually, according to *NBR*'s Barry Colman, Telecom "couldn't get the price right," and the job of creating *NBR*'s on-line presence went to Clearfield (later Clearview) Communications.

In the end the threat of Xtra as a content provider never really eventuated. Horrocks' role was marginalised, with content officially controlled by publishing manager David Maire, who had entrepreneurial skills but no media experience. And the realities of the media business soon struck home. The site did not attract a profitable level of advertising. And Xtra's young content team must have wept as ClearNet's web site, a nicely done bunch of links created by the Hamilton firm Webmasters, won plaudits and awards on its December launch. Xtra's site had far more substance – but all of it was obscured behind the dread dark wall of X-ville.

In September 1997 Xtra, alleging 74,300 customers, undertook a site redesign which among other things shrunk the huge X-ville graphic that had been such a turn-off for low-end dial-up users. It added the *NZ Herald* and others as providers of Microsoft 'Active Channels.' In February 1998 it entered the travel business, partnering with nine other companies to launch Xtra Travel Club. Its customer base headed precariously close to the 100,000 mark. By May its IP telephony trial with VocalTec had proven a failure. Xtra then took up the BNZ Buyline service and launched Xtra Business Builder. It lost MetService as a customer after service failures. Then in June 1998, Xtra unveiled Auckland Live, the first of a planned network of on-line 'villages.' It now had 119,400 customers.

Xtra boss Chris Tyler had hopped the Tasman to join Solution 6 less than a year after Xtra's launch. His replacement, Bob Smith, began refocusing the business and quickly declared an end to two of Tyler's pet projects. The first was the plan to package Xtra as an ISP-in-a-box for other telcos, and to 'franchise' Xtra internationally. But with a failed billing system and a poor technical record, Xtra really had nothing to sell. The second was the 'media engine,' an idea even Tyler's staff never understood. Smith reworked Xtra into 'three key business divisions': electronic commerce, communications, and

publishing. E-commerce was put in the hands of Nevin Grieve, a veteran of the NZ On-line days, who improved Xtra's lacklustre Internet shopping story. Buyline, a credit card authorisation scheme with the Bank of New Zealand, and Intershop, a German-developed web shopping system, were bundled into Xtra Business Builder, a package that, for almost the first time, made Xtra attractive to third-party Web developers. Under Peter Hutterli, the access business finally started to provide the leased-line services business customers wanted, and consumers were offered new prepaid 'advance' rates. This helped stem a flow of customers to flat-rate ISPs such as Ihug and provided reliable monthly cash flow.

Smith also fixed a glaring problem area, Xtra's telephone helpdesk, by spinning it off to the call centre specialist Teletech. Helpdesk performance had been a victim of Xtra's technical problems, but the outsourcing worked. Quality improved and Xtra had a significant problem out of its hair. Smith's IS background also helped shape Xtra Business Network, a system of approved service providers based on the channel model common throughout the IT industry. Internet was, he declared at the launch of Xtra Business Network, "just another service business."

Despite the stream of controversies and the restructuring behind the scenes, Xtra seemed quite happy about its progress and its successes in the market, making that quite clear in a press release celebrating its first birthday on 15 May 1997:

Phenomenal. Astonishing. And on the odd occasion, bewildering." A few of the words General Manager Bob Smith used to describe the first year of New Zealand's largest Internet service provider as Xtra turns one. Mr Smith, recently appointed as General Manager of Xtra, said that the New Zealand Internet industry had grown at a furious pace in the last year and that Xtra's presence was a major factor behind that growth.

In our first year, we've had our growing pains and, while there is no doubt we've had moments where we were less than happy with our performance, this must be balanced with the overall success of XTRA. From 15 May 1996 to 15 May 1997:

We've gone from zero to 51,000 customers;
We've developed a range of great Web content; we started with a blank page and developed a sophisticated and much praised site that is refreshed and updated in response to our customers' changing interests and demands;
We are now hosting over 80 NZ web sites;
We've built some key sites including the Official NZ Rugby and Netball sites, and the Xtra Smokefree Rockquest '97 site;
We've picked up the TUANZ award for Best New Product/Service for 1996 and the 1996 PC World readers awards for Best ISP and best NZ web site.

In July 1998 Xtra faced a further restructuring after turning over only $20 million in its first full year in operation, a shortfall of $40 million. There were subsequently 15 redundancies made from the 150-strong staff. It had opened nearly 150,000 accounts in two and a half years through a huge mass market campaign but in the process learned some hard lessons. Xtra was rebranded as Telecom Xtra, with Telecom admitting it did not expect to recoup costs for another two to three years.

Eventually Xtra made progress in bringing the advertising industry on-line. Chantal Dunbar was brought from ACP in a sales role, and AGB McNair was hired to conduct New Zealand's first web site audit. McNair measured daily visits to the Xtra site at 17,491, making it apparently the most-visited site in Australasia. But was the site's content driving those results, or was it the inevitable result of the site being the home page of hundreds of thousands of users? Despite the

fact the Xtra site probably reaped more advertising revenue than any other in the country, the basic problem remained: If Xtra was in the media business its 'content' remained locked up behind a top page which flouts almost every element of Web publishing wisdom. If it was a portal site, the same criticism held true.

Under Smith, Xtra moved back towards a Telecom culture. Ties were no longer lopped off at the door, and customer growth settled down to a steady 10,000 or so a month. Xtra's content business still wasn't scoring any hits, but seemed to settle into a groove. Telecom communications staffer Quentin Bright moved across to manage a new community initiative based around Auckland Live, the first of many planned regional sites. Bright brought media experience and did what Xtra had failed to do for so long – making small but significant partnerships, with Peter Fowler's Newsroom, for political coverage, and the street mag Lava, for local entertainment listings.

Further restructuring bought Xtra under the control of Telecom Services, resulting in more staff losing their jobs and the company looking more closely at its core business. Was it a media content company or an ISP? Regardless, there were still issues. TVNZ had waited all year for progress on a proposed joint America's Cup web site only to find Xtra had put up its own Cup site…[39]

PROHIBITIVE PC PRICES

One of the major impediments to uptake of Internet in the late 1990s was not only the high cost of an ISP account – you would have been hard pressed to find anything under $40 a month – but the cost of owning a PC.

New Zealand was way behind the rest of the world. It seemed we had become a dumping ground for older hardware that was perhaps two years behind the curve of leading-edge software demands, and we were paying about $500 more for these machines than the United States.

Chris Barton, IT editor at the *NZ Herald*, did some serious research and announced New Zealand PC buyers were getting a raw deal. While you could get a basic PC in the United States for less than US$1000, it was difficult to find an equivalent sub-$2000 anywhere among the major resellers. There were some examples from smaller local assemblers. Entry-level mainstream machines were still around $2700 for a 300MHz Pentium II chipped machine with 32Mb RAM, 4.3Gb hard disk, 14-inch monitor, and 32x speed CD-Rom. Barton costed out the components of a similar machine at $1869.

He blamed the exchange rate, adding 12.5 percent GST, freight costs, an inventory glut, and high retail margins and suggested sub-$1000 machine were just too difficult for retailers to make a profit on. About two and a half months later he noted there'd been some change with next-generation chips due out. The price of PCs had scaled back and the entry of AMD into the chip market against Intel had also brought some relief. The strong marketing tactics and lower prices of machines from the likes of larger local assemblers such as PC Direct also contributed to the arrival of a $1500 and $2000 price point, although these were still minimum configuration entry-level machines.[40]

8

The rhythm method

Regulation by litigation

Integration is not a benefit of the network but has to do with what you attach to the network. The user is the integrator. The network doesn't integrate it is only a carrier... Telephone companies can't seem to get it straight in their heads – they believe they are the integrators. The network doesn't deliver value. Speed, protocols, extra bandwidth and voice capability are cost issues. Adding value is a highly personal interaction… If telephone companies begin generating information and playing with it this could lead to the ultimate monopoly.
Canadian futurist J. James Mackie, addressing the TUANZ conference, August 1993.

In 1990 when New Zealand became a leader in deregulating telecommunications there was a sense that the country was breaking new ground and would soon be in a position, with affordable bandwidth, to develop and use smart new applications so we could play at the leading edge of a brave new world.

We were told this new openness would give our entrepreneurs and business pioneers an edge that would quickly reflect on the bottom line of our economy and lead the way to export growth. What we got was a series of costly experiments that turned New Zealand into a telecommunications laboratory for others to learn from and gave little back to the consumer other than cheaper toll calls and a fiercely protective incumbent carrier that hogged the data market.

While the universities were battling to get international access and trying to cope with the growing demand for their campus-based number 8 wire access arrangements, the telecommunications carriers seemed at first oblivious to the Internet. They stayed firmly focused on their own tactical war based on phone calls and high-end data services, which proved such a distraction the window of opportunity onto the brave new digital world began to close.

There were no clearly defined rules and regulations for network interconnection, and because Telecom allegedly owned all the overhead and underground copper lines into every home and business and claimed ownership of the phone numbers as well, there were prolonged battles for

new players to strike agreeable local access terms. Telecom was doing all it could to invest in new infrastructure while keeping competitors at bay with every ploy possible. Millions of dollars were spent on litigation as competitors sought to connect into the 'last mile.' Telecom held tightly to its tariffs so benefits at best trickled down. Data services, the key area for real business competition, were the last bastion; if you weren't in the central business districts of the main centres you were in for a long wait.

Communications Minister Maurice Williamson found himself in a running battle, attempting to drag Telecom kicking and screaming into an arrangement where Clear and others could interconnect with its network at reasonable rates. "What we ended up with was this Baumol-Willig junk which says if someone takes part of your business off you, then they have to pay you a full equivalent of what you were earning anyway. In the end Telecom could have lost its entire business and still retain the same revenue strength." So what was this Baumol-Willig business? After a number of legal disputes over local access interconnection terms between Clear and Telecom from 1991 onwards, Clear sought interconnection at incremental cost, with payments between the two companies on a reciprocal basis.

Telecom responded offering terms based on the 'Efficient Component Pricing Rule (ECPR),' also known as the Baumol-Willig rule, which would have required Clear to pay it the 'opportunity cost' of providing interconnection together with a contribution to common costs and profits, including any monopoly profit foregone by Telecom from loss of business. The case went to the Privy Council, which held that the Baumol-Willig rule did not breach the Section 36 of the Commerce Act which dealt with anti-competitive behaviour. The government was opposed to the use of this pricing principle because it had the potential to lessen competition. The companies finally agreed to set access prices at levels below those implied in the rule.[1] With some form of interconnection finally agreed to, the formative competitive market could at least begin to make some headway.

The hype about the information superhighway hadn't slowed down, only the ability to deliver it. Demand was being driven by the growing power of PCs, the drop in price of computer memory and hard disk space, and the need to send more complex documents and images. The ability to move documents between PCs and across an office network at 10Mbit/sec over Ethernet cabling had existed since the late 1980s and many internal networks were now capable of 100Mbit/sec over copper and fibre. The desktop revolution was showing no sign of slowing but moving data at speeds beyond 2Mbit/sec over the Telecom network was impossible, unless you had your own WAN between locations, or leased a dedicated digital data line from Telecom.

Visiting futurist J. James Mackie warned users to start taking the lead in provision of new services and stop leaving it up to the telephone companies which, he said, shouldn't be in a position to dictate. "Telephone companies don't know what to do with bandwidth; their mandate is to collect tolls. More should be happening here in this completely deregulated market." He said the fortunes of the future were not to be made in hardware or networking but in the provision of new services which should be "one of the greatest business adventures of our time."[2]

In its communications policy in July 1993, the Labour opposition party stated its deep concerns about the state of play in deregulated New Zealand, suggesting we were seriously slipping behind. The solution was to extend fibre-optic infrastructure to every home within the next ten years. Labour leader Mike Moore warned we needed to speed up our implementation of telecommunications or be left behind by what was now being taken for granted in the first world. He said the market could not be relied on to produce a national fibre-optic network, and it would fail unless the government got behind it.

MARKET FORCES BE WITH YOU

Maurice Williamson, however, stuck to his hands-off stance, continuing to wax eloquent about New Zealand being a world leader in telecommunications. He claimed fibre-optic penetration and the level of digital exchanges in New Zealand was higher than in any other country in the world, despite that technology being largely reserved for Telecom's own services.

Telecom claimed to have invested $3.3 billion in its infrastructure, having introduced the concept of the 'intelligent network' and No 7 signalling to add value to 0800 and 0900 calling, automated calling cards, Centrex virtual PBX, and enhanced ISDN. However nationwide ISDN and broadband (2Mbit/sec-plus) infrastructures remained tethered by interconnect arguments and endless court battles. By mid-1993 there were still only interim interconnection agreements between Telecom, Clear, new GSM cellular provider BellSouth, and third cellular player Telstra, which planned a service by the end of the year.

It took several years but in 1992 Telecom finally reached an agreement with Clear on local service interconnection and began to engage in a price war over toll calls. Telecom chairman Peter Shirtcliffe claimed the cost of long-distance calls had dropped 45 percent over five years.[3] In the absence of strong guidelines for competition Telecom remained the de facto regulator and the courts the de facto policy makers, leaving the former government department free to glean the maximum from captive markets. The courts even ruled to disallow the Commerce Commission inquiry on telecommunications, which had identified eight obstacles to competition, reflecting Telecom's role as supplier and controller of the market. The report singled out lack of competition in network and value-added services as being of particular concern.

New Zealand remained the only country in the developed world with no telecommunications regulatory agency. It relied instead on the Commerce Act, the courts, and the Commerce Commission. As Sir Geoffrey Palmer pointed out, this situation reflected New Zealand's inexperience in dealing with competition. For decades we had state monopolies. Once those were sold off, we were left with little awareness – let alone adequate coping mechanisms – of the potential dangers that private monopolies can pose to competition. The Commerce Commission obviously felt powerless to pursue the matter further when it had the courts to contend with and a government determined to keep its distance:

> *Telecom has become the de facto industry regulator; it owns or controls most of the critical inputs, it competes with all the firms to which it supplies those inputs and, by and large, it makes the rules under which competition is permitted to take place, Commerce Commission report, 1992.*[5]

Don Wallace, chairman of TUANZ, likened the interconnection debacle to a car stuck in the mud with the occupants so busy arguing about whose fault it was they had no energy to push the vehicle back on the road. They need a tow truck, he said, but the only tow truck operator in town didn't want to get involved. Deregulation of the New Zealand market was supposed to have opened the way for cheaper, faster, more sophisticated services, but the delays infuriated Clear and BellSouth. Clear manager Neil Tuckwell claimed two years of opportunity had been wasted. BellSouth managing director Keith Davis doubted whether the company would have gone ahead with its plans for New Zealand had it known the difficulties that lay ahead. If it wasn't for the deep pockets of both competitors they may not have survived the wait – and it was still far from over.[6]

In 1993 BellSouth had launched the first mobile phone network to compete with Telecom, and Telstra purchased 20-year rights to operate a second mobile network, then sold its spectrum to BellSouth in return for mobile services. Meanwhile Ameritech and Bell Atlantic reduced their

FAR LEFT: ICT Minister Maurice Williamson fielding questions from the media at TUANZ 92. TUANZ Archive.
LEFT: Clear Communication's first chief executive, the late Andrew Makin. TUANZ Archive.

Clear Communications general manager Neil Tuckwell.
TUANZ Archive.

ABOVE LEFT: BellSouth New Zealand manager Keith Davis. TUANZ Archive.
MIDDLE: Peter Shirtcliffe, chairman of Telecom Corporation from 1990–1999.
ABOVE RIGHT: Don Wallace, former TUANZ chairman and telecommunications consultant.

Telecom shareholding to a combined 49.6 percent. Massive investment was being made in increasing telecommunications capacity between New Zealand and the rest of the world. In March 1992 the $200 million Tasman 2 submarine fibre-optic cable between Australia and New Zealand was switched on. This was the first stage in the massive Pacific cable network due to ring the Pacific basin by 1994. In June 1993 the $500 million PacRim East undersea fibre-optic cable between New Zealand and Hawaii, a partnership between Telecom, AT&T, KDD, and Telstra Australia, became fully operational, offering voice, video, and data transmission. A year later the third stage of the Pacific cable network connecting New Zealand and Australia with Asia via Guam was live.

WHO NEEDS BROADBAND ANYWAY?

In July 1993 Eddie Paterson, Telecom's group product manager for data solutions, articulating his blinkered view of market demand, said he couldn't see a business case for anything beyond 2Mbit/sec, even among larger corporations. About 90 percent of users didn't need anything more than 48kbit/sec–128kbit/sec for LAN to LAN traffic although there would be an increasing need to mix DDSs with ISDN, when usage reached a threshold. However he did admit New Zealand was way behind the United States where 30Mbit/sec was now common and many organisations were migrating to the new ATM standard for 155Mbit/sec speeds.[7]

Clear had a fibre-optic backbone running down the centre of the country and a second around the East Coast, costing around $50 million, was under consideration. The competing carrier had invested $160 million and achieved about 16 percent market share since it kicked off in February 1991. That had translated to about 150,000 customers including more than 100,000 in residential areas. Clear had chosen not to develop the high-end data market because of perceived barriers to competition, including lack of access to the local loop.

Manager Neil Tuckwell said Clear wanted to offer a full range of services based on an intelligent network capability, including ISDN, and was investigating options. By 1993 it finally had its own version of 0800 (0508) and users could drop the 050 prefix in front of every Clear number they called. It had access to 15 centres and attempts to negotiate an additional 27 points of connections had been going on for a year. A small mountain of technical and political issues needed to be scaled before it had full access.

The main sticking point was Telecom's insistence on charging Clear as if it were a retail customer. Clear complained under section 36 of the Commerce Act, claiming Telecom had acted in an anti-competitive way by purposefully restricting access to a full range of services. The biggest concern was bundling – a discounted grab-bag of telecommunications products – often presented to customers on the condition they don't switch carriers. Clear couldn't reciprocate because it didn't have the breadth of products to bargain with, such as local loop access and Centrex.[8] The long-standing legal battles between Clear and Telecom over competition law eventually ended up at the Privy Council in London. The only winners were the lawyers. The decision backed Telecom's right to maintain its monopolistic activities.

In the absence of true competition the focus remained on proprietary services or enhancements to Telecom's own network. There was little sign of lower data-networking costs or for that matter any discussions about the Internet at a level that businesses might take heart from.

Netway Communications, a partnership between Telecom and Freightways, had become something of a renegade outfit operating just outside of Telecom's corporate arm. It had done a deal with Tuianet to provide frame-relay circuits when all other negotiations had failed. Managing director Malcolm Dick's serious faith that competition was 'good and healthy' and then backing it up by using Aussat for trans-Tasman communication and leasing space from Clear must have raised some eyebrows. In September 1994 he stepped out of the box again and announced a retail ISP service for corporate customers would launch within six months. It didn't. Netway had been pulled back into line, and Dick was soon off to Australia to seek his fortune.

By June 1995 Telecom had enjoyed seven consecutive quarters of revenue growth and an earnings growth rate that ranked it with the top 15 percent of telcos worldwide. Clear finally reached an agreement on local service interconnection after spending $8 million trying to resolve ongoing disputes. Remarkably, it had managed to achieve an estimated market share of 23 percent during its four years battling the incumbent.

It wasn't only the cost of faster services like ISDN or leased lines and the ongoing carrier squabbles that were concerning users and curbing the growth of businesses; the charging regime

for bandwidth at the Waikato Internet gateway (NZGate) was also an issue. The speed of the international connection had doubled to 256kbit/sec in July 1995 but ISPs were feeling the pinch with per megabit charging.

According to Net Wizards and a report by Colin Jackson at the Ministry of Commerce, New Zealand's Internet use had been through a rapid growth spurt, leading the world in uptake. However browsing the Web had become something of a luxury, particularly for those visiting offshore sites or for US users visiting local sites. While US users got to surf free-of-charge, New Zealanders were paying up to $8 a megabyte, regardless of which way the traffic was flowing. Several proposals were put forward to ease concerns, including set fee charges, home-page mirroring, and fee reductions at NZGate.

The problem was that NZGate hadn't shifted from its original billing approach, which enabled it to share the cost of traffic between universities and research institutions to cover international bandwidth costs. The subsidy from NASA had disappeared in 1994, and charges were now being passed on to the growing number of ISPs who linked directly into the Waikato exchange. Waikato was charging providers on monthly volume (around $3.50 to $4.50 a megabyte). Iconz, the PlaNet network, Actrix, Cybernet, and others had to pass on this charge to users, typically at $2.50/Mb–$4/Mb for national traffic and $4/Mb–$8/Mb for international traffic.

CompuServe, IBM, and Microsoft were currently the only providers offering access independently of Waikato, although David Dix's KC Computer Services had its own international gateway for select customers. Waikato gateway manager John Houlker had to justify the charging by reminding users that New Zealand was one of the most expensive ends of the Internet and suggesting larger providers look at their NZGate fees; if they were fairly stable he suggested they should consider charging a flat rate.

NZGate was doing what it could to bring charges down and speed up the flow of traffic, including creating a mirror site for New Zealand content in the United States to cut down on costs. Houlker suggested web site owners keep rich content such as videos off their sites. However Alan Marston, founder of the PlaNet Network, was refusing to put up any web sites until the charging issues were resolved. Even without Web page access, PlaNet was paying Internet umbrella group Tuianet about $1000 to $1500 a month. "It is inconceivable that we'll put up a web site with our stuff on it when we have to pay every time someone wants to look at it," he said. New Zealand was becoming a very sought-after location for international people to explore. "Anything about the environment or alternative lifestyles is very popular. You should be able to make a Web page with valuable information that would benefit New Zealand without having to meet the complete cost or pass it on to subscribers."

Meanwhile ISPs were considering whether to charge per kilobyte stored on their Web servers or flat or monthly rentals per page to get around data volumes. Time-based charging was another option being considered. David Dix had hedged his bets with links to NZGate for his main users and dedicated international link to Hawaii for commercial customers who wanted more bandwidth. At the time he was hosting about 30 pages with different arrangements for each. "One company has had four pages up for three months and it cost them less than $100." However he warned that New Zealand's growing attraction for tourism and travel opportunities presented a problem. "You'd be swamped if you put up that kind of home page, but you have to weigh up the cost and what the value is. Providers have to be flexible and help their customers work out what is best for them."[9]

If the competition model wasn't seen to be working among the big carriers, the principles of letting the market decide were certainly starting to have an impact among small- to medium-sized ISPs, who had generally taken a relatively laid-back approach to the market they'd had to themselves

since 1992. Early in 1996 there were about 40 ISPs servicing around 160,000 users. Competition was heating up, and everyone was looking to cut costs while still retaining and growing their customer base.

Most ISPs were still taken back by Ihug's bold move into flat-rate charging, and it was clear that telco and ISP tariff models needed urgent reworking. Increasingly the answer to the dilemma was being seen as flat-rate charges to a megabyte limit and then time, or per-Mb-based charging, thereafter.[10] Full interconnection had finally been signed off between Telecom and Clear, and international carriers such as SITA, Telstra, and MCI were now vying for business. There was great hope the promised rewards of deregulation would at last be delivered to long-haul data customers, including ISPs.

WHO'S THE GATEKEEPER?

Having only peeped over the commercial horizon in 1992 the Internet was consuming ever-increasing bandwidth and in turn costing the Waikato University gateway and subscribing universities a small fortune.

Traffic through NZGate had quickly outgrown the original ANZCAN undersea copper network and maxed out the capabilities of a satellite connection. From 1993 backbone traffic had been delivered between New Zealand and the United States via frame relay over the $500 million PacRim East undersea fibre-optic cable owned by Telecom in partnership with AT&T, KDD, and Telstra Australia. Gateway manager John Houlker made frequent visits to Telecom asking for circuit upgrades on the satellite and then on PacRim. "We were demanding more capacity than any of its other international customers. I'd been trying to tell them this Internet thing was really important but I don't think this had much impact until they started adding up what we were doing with all this bandwidth. I wanted them to be aware of the demand so they could plan better on their side but also to keep in the loop because it was logical to me that they would ultimately be involved in this business."

Eventually the main carriers began to see this was indeed their territory and discussions about their involvement began in 1994 when the NASA funding finally faded out. Initial negotiations to operate wholesale services through Waikato involved Telecom, Clear, and overseas operators including MCI. Waikato University was now sharing the full cost of international links with all the other universities and CRIs on a volume basis.

NSFnet had moved across to three private backbone providers but NASA was still managing the US end of the connection at the Federal Internet Exchange (FIX West) gateway, with a link into the next-generation supercomputer networks. The arrangement with the PACCOM community, which Waikato was party to, was expected to come to an end with traffic moving across from NASA Ames to the proposed FIX East gateway. Houlker recalls being New Zealand's representative at the Tokyo meeting of the International Engineering Planning group for the Internet in 1992, where half the agenda was taken up trying to decide on a name for proposed new commercial exchanges to attach to FIX East and FIX West. There was eventually a consensus that they be called MAE East and MAE West, short for long haul 'metropolitan area' network. However various political and technical obstacles meant the proposed shift to commercial routers at the MAE West exchange failed to eventuate. In 1995 when NSFnet reverted to its initial role as a Federal research and education network and NASA, under its public non-profit charter was no longer supposed to be in the business of carrying commercial traffic, New Zealand remained an exception, continuing to operate through NASA equipment.

It was a time of transition as the neutral NZGate and Tuianet, the non-profit body that administered the science and research network, prepared to hand over the commercial side of their

businesses. Waikato was hosting two high-speed circuits to the United States, effectively serving the entire Internet community as well as the science and research networks. From May 1995 the amount of commercial traffic moving across NZGate and Tuianet grew significantly, because most universities were still acting as providers for their own campuses and delivering links into commercial ISPs. A few ISPs operated their own international links and while some ran long-distance links between particular cities, there was no apparent advantage in constructing a separate commercial backbone to mirror the Tuia backbone.

That all began to change rapidly and by the end of the year, research and educational institutions accounted for only half of New Zealand's international Internet traffic. Commercial international traffic was divided roughly equally between the Tuia network and other links to the Hamilton gateway. The highest-capacity connection within the Tuia network was the 512kbit/sec link between the University of Waikato and Victoria University. Most links were at 64kbit/sec or 128kbit/sec.[11]

Both Telecom and Clear had signalled their interest in taking over the responsibilities of NZGate. The ideal time for the handover would be before the end of January 1996, when Waikato's international leases were due for renewal; it had committed to 12-month contracts to get the best possible deal on bandwidth. The complicated part for Waikato would be how to cleanly manage itself out of its existing technical and customer relationships. It had choreographed everything for a seamless handover at the end of 1995 but then Clear seemed to back off, and it appeared for a time that Waikato had acquiesced and simply handed over everything to Telecom as sole wholesale provider. In fact Waikato didn't sell anything to anyone. Clear had planned a concurrent entry but got the jitters. It was only through strong persuasion from Houlker and his associates that it was back in the game, although a month behind Telecom.

The shift to Telecom and ultimately Clear was anticipated as a natural evolution. The complicated bit was how Waikato would phase out the research and education network and the provision of ISPs without being left with a debt. Houlker admits he should have kept a closer eye on that commercial risk. In the end a handful of ISPs decided not to pay their last bills. "They never settled their debts with the universities when they moved across to the new commercial services, and some of those debts were quite significant. Fortunately we had enough of a buffer to cover it but we were a little surprised."

The other unfortunate challenge was exiting responsibility for the third circuit which Waikato had established with Australia. This had initially gone in to the University of Melbourne in 1993 and then moved to a university exchange in Sydney. While the trans-Tasman frame-relay connection had hugely improved the flow of Internet traffic Australia had never paid for its share. Attempts to recoup the cost proved futile, and further complexity was added when the US backbone was privatised. Houlker said the Australian gateway router didn't have sufficient memory to view and process the complete routing table of New Zealand traffic, and it was never upgraded even when this clearly presented a problem.

Traffic from some New Zealand ISPs continued to route there even after Telecom and Clear took over the gateway. "Australia had applied illogical decisions about routing which meant they couldn't see the detailed routing decisions being made in New Zealand which caused some traffic to flow over that line when it shouldn't have. Clear didn't have an arrangement with Australia but some of its ISPs continued to go direct through Australia. We attempted to bill those companies but only a few paid up. We had no way to stop them even after we were no longer operating the circuits and had vacated the scene. We got caught in the middle and took a hit on some of that. We could have blocked the routes but then a lot of companies would have lost their connection to Australia which would have been too draconian," said Houlker.

When Telecom and Clear took over, the AT&T and Sprint circuits were still going directly into NASA's FIX West gateway. Soon after, there was an exponential growth in private and commercial sector traffic. Telecom's subsidiary Netway Communications began to take a more active role in managing the provision of bandwidth, adding a second 512kbit/sec circuit through US carrier Sprint to complement the existing frame-relay service provided by World Partners, an AT&T and Telecom consortium. Clear Communications managed its own pathways to the United States.

Waikato University, relieved of the task of bandwidth provision, continued facilities management of the equipment installed at its premises, while the new players sorted out how they would manage their new gateway functions as wholesalers to the nation's ISPs. A remaining challenge was maintaining harmonious interconnection arrangements with ISPs and network providers so New Zealand Internet traffic didn't end up bouncing around the United States, for example, before it reached the browser or email box of the intended user who might be across the street.

Waikato continued to provide advice on ways to encourage competition and improve both pricing and quality of service. Under the new deal the universities would buy capacity as if they were commercial ISPs. The prime concern during the handover was that no single company could take control of the Internet in New Zealand.[12] There was understandable concern, particularly among the existing service providers, that the carriers would soon launch their own ISPs as they had in other countries.

ISPS PUSH FOR FAIRER DEAL

Meanwhile the winds of change were blowing through the fledgling ISP market, which was rapidly evolving with Voyager far and away the strongest competitor and CompuServe, Iconz, and Ihug battling behind. ISPs had to lift their game to provide a better level of service to customers and sort out their arrangements with Telecom. Everyone was waiting for the carrier to make its move. The gigantic splash came when Telecom's Xtra jumped into the pool among the 50 or so other ISPs in May 1996, claiming 10,000 users within four months, and changing the whole dynamic.

In August 1996 Xtra cut its rates by 50 percent and its 0800 access prices to $1 an hour below Voyager's. Xtra's entry price was below other ISPs' and had a dramatic effect, with many smaller regional ISPs unable to compete and shutting down. IBM and CompuServe didn't even try to keep up; their international infrastructure and minimal local points of presence no longer gave them an edge. Voyager lost significant business during this period. It was unable to meet the new pricing regime due to its cost structure, which it complained was largely dictated by Telecom, from whom it purchased bandwidth and an 0800 service.[13]

The water was further muddied when Clear signed a $2 million contract for dial-in modems and routers and several million more in establishing 15 points of presence (POPS) around the country. When it launched its ClearNet ISP in November it made no pretence at creating a separate branding; it was obviously a business unit of Clear with a strong focus on business customers. ClearNet's pricing strategy was different to Xtra's and based on peak service demand times ($5.95 an hour); its 0800-access service was unable to compete with Xtra's toll-free pricing. However it quickly captured about 17 percent of the market.

Plain Communications managing director Robert Hunt ended up in conversation with Mark Frater from ISP Quicksilver and both agreed it was absurd that the individuals at the top of each ISP organisation didn't have a common body representing their interests. "We thought if all the ISPs were to get together in a room we could push for a fairer playing field in the industry," Hunt said. A major catalyst was what he and others saw as targeted anti-competitive behaviour by Telecom and Xtra against the rest of the ISP community. "The pressure on ISPs was extraordinary

and the way Telecom was doing the wholesale side of things was unbearable. It was way beyond ridiculous." He claimed Telecom had allocated Xtra an 0800 dial-up service at a much lower rate than anyone else could get access to. Such concerns resulted in the formation of the original ISPANZ in late August 1996.

ISPANZ was not only seeking a better deal with Telecom; it was seeking a more constructive market overall as ISPs generally didn't feel their interests were being represented by the newly formed ISOCNZ. The fact that it had established a monopoly register with its company Domainz didn't help either. "We saw the need for ISPANZ to be clear and distinct from all of that. While the Internet Society had some mention of ISPs in its charter it seemed their main focus was on the public or users with an absolute minimum of consultation or any kind of involvement by the organisations around New Zealand who were supposed to be delivering Internet to people," said Hunt.

Although the computer press reported about 90 percent of ISPs were members of ISPANZ, a large number, in Auckland in particular, did not join, either because they weren't clear about the objectives, or felt it was a Telecom-bashing group. Then Voyager took Telecom to court over the 0800 access issue and got a last-minute backroom settlement. That signalled the end of the line for ISPANZ as Voyager pulled its membership. "Things became very divided and it was clear we weren't going to get the kind of unity we needed after that," said Hunt.

The Commerce Commission determined at the end of the year that Xtra was getting the same rate for 0800 calls as all other ISPs.

A CAT OR A FOX?

In June 1996 the government reaffirmed its reliance on general competition law to achieve its objectives in telecommunications interconnection deals, which it said should be based on terms that would promote efficiency and deliver the benefits of competition to consumers.[14] It also made it clear that it did not accept the Baumol-Willig ruling that Telecom had tried to push through the courts. Although the Privy Council had claimed this rule, which would have compensated Telecom for losses made through competition, was not anti-competitive, the government opposed its use but failed to suggest an alternative. Subsequently, Clear and Telecom agreed on an interconnection agreement that served as a template for all other interconnection agreements. It was neither based on the Baumol-Willig rule nor cost-based. Arguably, access seekers were from that point reluctant to dispute interconnection pricing in case the Baumol-Willig rule was applied by the courts. In other words, in the absence of specific legislation requiring some other pricing principle to be applied, the courts might be obliged to apply the onerous Baumol-Willig rule.[15]

Telstra New Zealand had been granted a licence to operate international services to local business in March 1996 and by mid-year had entered discussions for interconnection agreements with Telecom and Clear for national, international, 0800, and other services. The agreement with Telecom took until November 1997 to complete.

An old Arab saying: 'my enemy's enemy is my friend' was an apt way for Telstra New Zealand CEO's Peter Williamson to describe how he would compete here. He would start by winning ten percent of the $3 billion New Zealand telecommunications market over the next three years, be 'extremely price competitive' and have a complete range of services. Telstra planned to be in the bandwidth re-sale market and use 'tails' off its nationwide private switched network based around the massive $8 million Ericsson AXE switch installed in Auckland, along with multiplexing equipment, to provide bandwidth on demand. The switch and ancillary equipment were capable of not only delivering voice and leased line services but also ISDN. Williamson gave every indication Telstra

would enter the market by stealth. 'There are more ways to skin a cat than are known to most people.'

Telstra began focusing on the corporate market, with wholesale Internet offerings and plans to build fibre rings in Auckland, Wellington, and Christchurch. Williamson insisted the Clear-Telecom debacle would never have occurred in Australia, where interconnection rates were determined from day one. He likened the situation to 'leaving the fox in charge of the chicken coop.'[16] The company set up offices in Auckland, Wellington, and Christchurch, employed 60 staff, and had 1000 retail customers and four resellers of its bandwidth and services. Its main focus was large businesses. It was rapidly adding points of presence in Wellington to create a data backbone and had the ability to switch data between Auckland and Wellington with full access to Sprint's frame-relay service. It carried large volumes of wholesale Internet traffic and a business product that gave corporate customers guaranteed access times.[17]

Telstra New Zealand made a further $30 million investment in 1997 to achieve its aims. It just missed its targets for the first financial year but won a lot of trans-Tasman business. It expected to be profitable by year three and was benefiting from volume discounts by leveraging the best network capacity deals with Clear or Telecom. In effect it was now Telecom's second biggest customer behind Clear.

Telecommunications exports had surged ahead, major investment had been made in the economy by the big carriers, phone and cellular calls were cheaper, the customer premises equipment (CPE) market had opened up, international call-back operators were offering up to 50 percent discount to major destinations, and third parties were reselling everything from bandwidth to phone cards and satellite space. There were clearly identifiable benefits from deregulation but for those trying to deliver data services, and for frustrated business customers including ISPs, the market was nowhere near open enough. Research group Ovum declared in late 1996 that Telecom New Zealand had the highest interconnect fee in the world, at 3.37 cents per minute. In the highly regulated and price-capped United Kingdom, BT got only 0.78, Bell Atlantic (under a price cap) was getting 1.28, and in Australia Telstra's fee was 1.85.

Clear had operated with a toll bypass agreement, including an 050 prefix, for four years. It had sought local service access through the courts in 1992 but Telecom took until September 1995 to agree and March 1996 to sign it off. A year later the agreement had fallen apart. Clear wanted to renegotiate after Telecom launched its $5 'unlimited time' weekends. It had been paying Telecom on a per-minute basis for access to its network and in protest stopped paying a portion of its bill. So it was off to court again. Clear and BellSouth had also rejected a number portability deal, which had meant Telecom would continue to be paid per call, even after customers had left its network.

The legal wrangling over access rights and conditions remained painfully prolonged, largely because the Commerce Act, administered by the under-resourced Commerce Commission, was seen to have no teeth and the courts no independent guidelines. The Act often relied on court action to determine an outcome which had in itself bogged down the process of competition. BellSouth and Clear were backing a call from TUANZ, which wanted the government to adopt the telecommunications principles and guidelines that Communications Minister Williamson had been threatening to introduce for some years. TUANZ chairwoman Judy Speight said a clear set of principles and an up-front agreement on what was required for interconnection were needed: "(the government) should be driving those steps…the Commerce Act needs more backbone."

Meanwhile Australia, which had entered full deregulation in July 1997, was taking a page from the New Zealand experiment but with more serious consequences for those who stepped

outside the boundaries. The Australian Competition and Consumer Commission (ACCC), the general trade practices regulator, was given a role within telecommunications, signaling a shift from industry-specific regulation to general competition law. If a carrier was caught acting anti-competitively it could be fined up to A$10 million and A$1 million for each day the conduct continued. It had also pre-determined how interconnection would occur and what fees would be paid.

Despite five other carriers being registered as telecommunications companies, and 11 as international operators, the same delays evident from day one of new Zealand deregulation persisted. British Telecom had taken 100 percent control of Clear in 1996 and country manager Stephen Wilks quipped the Kiwis were the 'laughing stock of the industry,' claiming Telecom had simply priced any competitor out of the market with high infrastructure fees. Between mid-1996 and 1997 "there were 96 complaints and only one of them was investigated. That's an absolute joke. You could not get a more damning indictment."[18]

INTERNET BROWNOUT

New Zealand had been assured it had all the international communications capacity it would ever need with PacRim East, PacRimWest, and Tasman 2 fibre-optic undersea cables linking us to the rest of the world. By mid-1997 this capacity was all booked up largely due to the growth of the Internet. Telecom was partnering with Australia's Optus to build a new $1.44 billion 'big pipe' across the Tasman before the Americas Cup, and the other carriers were seriously looking to extend their international capacity. Telstra Australia admitted it was already carrying more data than voice traffic on its network.

After Telecom was sold to former Baby Bell's Ameritech and Bell Atlantic, we were told we now had a 98 percent digital switched network and that the days of exchange overloads between the major cities were over. However the once familiar "I'm sorry but this call cannot be connected right now because of overloading ..." was again commonplace and the Internet – the darling of the information age – had already experienced its first 'brown-out' in New Zealand.

By mid-1997 the exchange at Waikato University was using 14 ports, with 10Mbit/sec and 100Mbit/sec capacity, on a 1.2Gbit/sec backplane and all but one were in use. In May New Zealand lost international access to the Internet for eight hours when Telecom-owned Netway Communications' 512kbit/sec frame-relay connection into the United States went dead. A server in the United States crashed, and there was no alternative route to redirect Internet traffic on to its next destination. The Internet exchange server at Waikato University became overloaded and also crashed, leaving all outgoing traffic hanging in cyberspace. Netway promised it would add three more servers as alternative international routes for the local backbone.

Research group IDC declared one-third of New Zealanders' homes had a computer, and there were around 175,000 ISP subscriber accounts, suggesting this would rise to 260,000 by 1998 and 425,000 by 2000. We had the seventh-highest number of Internet hosts or permanently connected Internet sites per 1000 people. Our Internet uptake had been growing much faster than most of the world. Whatever else that meant it signalled huge pressure on the New Zealand Internet Exchange (formerly NZGate) at Waikato, where the bulk of Internet traffic come into and out of New Zealand. Technology working groups were looking at how to build efficiencies into the nationwide backbone, including better management of traffic routed from the ISPs to ensure it took the most direct route to its destination.[19]

INTERNET OUT OF SERVICE

After several days of intermittent operation the primary domain server at Waikato University simply stopped working on 28 January 1997, leaving the New Zealand Internet high and dry.

"Unless you knew the IP number for any site you wanted to connect to, attempts to access Web pages simply resulted in DNS error messages. Although the Internet was originally designed to be a highly redundant, fault-tolerant military communications system, it seems that it still has an Achilles heel," wrote web watcher Bruce Simpson on his Aardvark web site.[20]

Concerns about the stability of the Internet in New Zealand were further fuelled when the main gateway at Waikato University became overloaded and shut down international access for eight hours in May 1997. After a week of problems Netway Communications lost the international link when a digital switch at GlobalOne in Stockton, United States, failed for the second time in a week. All ISPs connected through Netway, including Xtra, lost service. Service was also lost in several other Pacific nations dependent on GlobalOne. The failure had no impact on Telstra or Clear's international circuits.

Telecom announced alternative data links were being installed by Netway, something that had been planned some time before. Netway had previously assured customers that it had back-up circuits in case such an event occurred. Unfortunately it appeared these also were terminated at the same US switch.[21] You would have thought the lesson had been well and truly learned but in August there was another outage for five hours when another network failure at Global One severed Netway's links to the outside world. A level of service was restored after 90 minutes through a server at Sprintlink, which was quickly swamped by customer demand, again shutting out the international connection. While Telecom spokesperson Peter Brittenden described the problem as "an unusual event," Aardvark's Simpson warned Netway's performance, due to problems with GlobalOne, could no longer be considered acceptable for commercial use.

Bruce Simpson commented in August: "The Net is no longer just the domain of academics and hobbyists. Many businesses are now heavily reliant on it for their email communications and also as a global sales and marketing vehicle. Indeed, a growing number of businesses are built solely around a Net presence. This time, if [Netway is] serious about being in the Net connectivity business they really should either change their US entry point or provide an adequate amount of bandwidth on those alternative data links that were supposed to be commissioned nearly a month ago!"[22]

PEER PRESSURE

In July 1997 the Internet Exchange (NZIX) at Waikato was upgraded from a single Cisco CAT 5000 to two fully redundant Cisco WS-2926 switches. Clear pulled its MCI circuits back to Auckland to avoid tromboning international traffic to Waikato and back. Clear, Telecom through subsidiary Netway Communications, and Telstra NZ were finally reaching some level of agreement on a peering exchange in Auckland. A triangle of 2Mbit/sec circuits was provisioned between the three telcos as an interim measure.

The proposal, initiated by Waikato and Auckland universities, was that exchanges be built to ensure more accurate routing of Auckland traffic from the carrier to the intended ISP. Wellington City Council's CityNet fibre-optic network, linking buildings in the central business district, would provide a central hub for routing Internet traffic in the capital. Such exchanges kept local traffic within a city where bandwidth was cheaper and also provided redundant paths so there was no single point of failure.

Roger Hicks, Clear's representative at the peering meetings, said the talk of routing protocols using ATM circuits in Auckland was akin to the establishing of five Network Access points (NAPs) throughout the United States, which were now run by the major phone companies. Pacific Bell in California, Sprint in New York and New Jersey, Ameritech in Illinois, and Metropolitan Fibre Systems in Washington were routing all the US and European traffic but due to unprecedented demand were already choking up. Now numerous peer-to-peer arrangements between ISPs were springing up to ease that congestion. It was logical and practical, he said, that New Zealand carriers work towards a robust solution before our own network drowned in data.

There had been backdoor paths between ISPs for some time; several of the larger ISPs including Voyager, ClearNet, KC Internet, and Ihug had their own alternative international routes. A consortium of ISPs, including Internet ProLink, Iconz and KC Internet had already established virtual links to keep local traffic local. Internet ProLink director Craig Anderson welcomed the move by the telcos to establish an exchange but said virtual exchanges became too expensive and unmanageable, particularly when more than three players were involved. "It would be ridiculous and very expensive for the 30 or so ISPs in Auckland to have links to each other's sites. Everyone would prefer a real exchange, managed by an independent body in a basement somewhere in downtown Auckland."[23]

Maintaining the high ground is everything when you are competing for coverage. A snapshot of several floors in Auckland's gleaming 'finger to the sky' tells the story of how things rapidly evolved in 1998. The 328 metre Sky Tower hosts all manner of media with 360-degree coverage of Auckland city and inner suburbs. The top 93 metres is set aside for microwave dishes, transmitters, telecommunications, and broadcasting equipment and FM, VHF, and UHF broadcasting. Competing telecommunications, television, FM radio, communications, courier, and taxi companies had staked a claim on prime sites. TVNZ, TV3, TV4, Telecom, Clear Communications, Telstra, Broadcast Communications, broadband wireless providers, and BellSouth were there, and Ihug saw it as the ideal site to supplementing its satellite coverage with broadband wireless across Auckland. It was also the ideal location for deploying wireless loop technology. Internet gateway manager John Houlker was a fan of the spread spectrum radio solution and believed the iconic location would be ideal for an independent Auckland peering exchange (APE). "I had set up a wireless hub at Waikato University at the time and even had an 11Mbit/sec link running to my house. Locating an exchange in the Sky Tower opened up all sorts of possibilities for wireless."[24]

New Zealand's main connection into the international Internet backbone continued to come through NASA's FIX West gateway until Kawaihiko, the de facto science and research network, shut down at the end of 1998. 'Not coincidentally,' Houlker, essentially having done himself out of a job, moved across to work for Telecom International Networks. His first project was to establish new landing points for its international circuits in Los Angeles and at the Palo Alto Internet exchange.

"As time goes by fibre-optic cables will be extended to virtually every house and office in New Zealand. This should mean that by the end of the century the whole of New Zealand

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will have broadband ISDN… able to carry television, stereophonic sound and begin to exploit the integration of different communications systems…" Professor John Tiffin, August 1987.[25]

"The country has one of the highest (Internet) uptake rates in the world. Approximately 20 percent of the population has access to the medium, over 750,000 people; well over 100,000 of them are commercial subscribers. This includes 35,000 organisations. After the initial upsurge growth in 1995 Internet subscriptions started to slow down in late 1996. Finally spurred into action by the Internet TCNZ started to revisit its ISDN service. Two price reductions took place over the last 12 months, but the service is still too expensive for most residential and small business users who make up the majority of commercial Internet users." Paul Budde, 'Telecommunications and Superhighways in New Zealand inaugural report,' 19 November 1997.

ISDN PUSHES NETWORK AND CREDIBILITY LIMITS

From the late 1980s all the talk was about ISDN, which seemed to be the panacea for communications demands; Telecom waxed eloquent about its potential to become the new nationwide network integrating voice, data, and video.

Initially no one imagined its applications for Internet access; it was simply a more flexible alternative to leased lines for moving rich data including publishing files or connecting PABXs. Basic rate ISDN had 2x 64kbit/sec channels plus a 16kbit/sec signalling channel (2B+D). But primary rate was the big news: it could deliver 30 x 64kbit/sec streams that could be aggregated for more demanding bandwidth needs. When aggregated you could get 2Mbit/sec if required, and that was ideal for larger PBXs and quickly seen as the perfect solution for ISPs whose backrooms were already overcrowded with banks of modems handling dedicated lines to terminate each call.

Closed ISDN trials were planned from 1987, and it was expected that by 1990 a narrow-band digital network would be commercially available, enabling users to operate telephone, videotext, packet switching, facsimile and various data networks as one integrated service.[26] However the hype was far from reality. In November 1990 Telecom was still expounding the virtues of the as-yet-unavailable service that would deliver 'teleshopping, telebanking, electronic books, even videophones.' The carrier was grasping at straws to try to define a specific business case. The 'high-speed digital telephone links' of this new technology being trialled in Wellington were still well over a year away. A Telecom media release in November 1990 read like a scene from the *Jetsons*:

Televoting, where people can record votes by dialing a telephone number, and caller identification are other services which become available through ISDN… which will play a significant role in business and other sectors. Medical centres and hospitals will be able to exchange high resolution images of X-rays, microscopic images of blood samples and CAT scans at "life saving speed… medical services in remote locations… with extensive applications in business, particularly in areas like financial dealing rooms, the transmission of video and film around the world which will impact on the film industry and news organisations.

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International law enforcement agencies will be able to rapidly transmit photographs and fingerprints of suspected criminals around the world at high speed with very high resolution."[27]

There was no hint of the Internet, which was about to burst onto the scene and shake everyone's perceptions about data services and interactivity. In fact the very application Telecom was ignoring would quickly become the one that tripped it up. By the time narrow-band ISDN arrived in 1992 it had virtually been superceded by 2Mbit/sec dial-up lines, the advent of next-generation frame relay (up to 45Mbit/sec), fast packet switching, and independent fibre networks.

Comparisons with Australia, where ISDN had taken off, were unavoidable. Incentives for New Zealanders to move to ISDN were minimal, and it wasn't particularly competitive with equivalent analogue or leased digital line services. The business benefits of having 2x 64kbit/sec or greater available on demand had not been made clear. Early implementations were seen as ideal for the office environment to simultaneously cope with fax, phone, and computer connections, eliminating the need for separate phone lines. Initial take-up was from about a dozen businesses for network back-up and large file transfer. Applications that could take advantage of the new service were still thin on the ground with many customers waiting on Telecom and its business partners to supply them.

Even the ISDN user group had to battle for information from Telecom about who was using the service, why and what applications were available. In the first quarter of 1993 there were only 50 customers, although this had tripled by August. In Australia there were 5000 primary rate users – 70 percent of them large PBX users – and 8000 basic-rate users. The majority of basic-rate users had terminal adapters for videoconferencing, LAN bridging, and modem replacement.[28]

Many businesses, including manufacturers, hospitals, publishing companies, insurance firms, and banks, wanting to exchange rich documents around the country and the world were eager for higher-speed connections. However the high cost, slow roll-out, and the congestion that that was now apparent in the Telecom network weren't generating confidence.

PA Consulting Group senior consultant Don Wallace thought ISDN could provide some benefits if users did their homework. Based on preliminary tariffs, ISDN appeared to be quite attractive to small- to medium-sized business with significant savings over traditional telephone lines because of the faster transmission time. A 20-page fax sent from Wellington to Auckland for example would cost about $7.20 to send conventionally but only $1.52 via ISDN. With file transfers, a 3Mb file would cost $38 to send conventionally compared to $6.08 through ISDN. Wallace estimated ISDN would cost businesses $500 per connection compared with $150 for an average phone and $1680 for the existing DDS. Rental would be $2000 a year and calls would be charged at the same minute rate as ordinary business calls.[29]

Users wanting to go beyond standard 14.4kbit/sec or 32kbit/sec modem speeds really had to do their sums. Even with a 20 percent reduction in costs in 1995 you still paid $400 per end for installation and $120 a month plus normal business call rates, if you could

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get the service. The reduction in cost increased demand by 160 percent, with around 1300 customers subscribing by September 1996. Even then it was a case of demand exceeding supply; customers had to wait three months to get the NTU into the country – a vast improvement on the nine-months wait when the service first launched. So why would anyone put up with this? It was a case of get it from Telecom or don't get it at all.

In fact early in 1997 Telecom refused to take on additional ISDN customers because it couldn't cope; its exchanges having hit a ceiling. It blamed ISPs using primary rate ISDN to service their customers. In May Telecom had reduced its DDS and Megalink prices by up to 30 percent and indicated there would be a double-digit drop in ISDN pricing of 'at least ten percent.'

By July 1997 Internet use in New Zealand was growing at 70 percent a year and placing the PSTN under considerable pressure. Telecom was looking at a number of ways to protect it from overload. Having upgraded the processors at all its major exchanges, it was now changing its architecture, boosting main trunk routes and switches and about to roll out a new IP overlay so it could better cope with pressure from the ISPs. Telecom admitted its voice network was not appropriate for long-term data use.[30]

The rush to the Internet had caught Telecom by surprise. IPNet, an overlay to the public telephone network that would allow ISPs to have virtual 2Mb circuits over frame relay into Telecom modem banks, was its solution. Telecom would own these modem servers but the ISP could still use their existing modems and IPNet on top of that. Later in the year there was even talk about upgrading IPNet to more efficiently distribute video and audio to Xtra subscribers.

Telecom service platforms manager Martin Cooper said total PSTN call minutes were forecast to grow between five and 23 percent a year to March 2002; total traffic would increase 2.8 times, driving strong demand for second telephone lines into the home. From July 1996 the impact of the Internet was really being felt but keeping up with the five to 23 percent annual increase was going to present problems, particularly with provisioning ISPs, which were usually based at a single location.

"We're expanding the PSTN to keep pace with the demand. At the moment there are 100,000–200,000 Internet users within New Zealand – that's about 8–10 percent of PSTN users," said Cooper. Once IPNet was up and running Telecom would look at deploying ATM[31] rather than frame-relay for Internet traffic.

In November 1997 Telecom announced a $700 million project to upgrade or replace 150 old NEC NEAC digital exchanges, which it admitted were the bottleneck in its attempt to meet market demand. After a Ministry of Commerce report showed its tariffs were 49–97 percent higher in many cases than similar markets, Telecom dropped ISDN prices even further. As previously, this occurred amidst concerns customer demand would outpace Telecom's deployment capabilities. Graeme Penn, country manager of IDC New Zealand, said Telecom was trying to do a balancing act between building volume acceptance of the product and maximising revenue but lacked the manpower to follow through. "Telecom doesn't have the resources to install it… Reducing prices will only increase the backlog... They are

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already installing ISDN as fast as they are physically able."[32]

Keith Davidson first became aware of the emergence of the Internet in the late 1980s when he was in a senior management position in the newspaper industry. But until Windows came along he knew it had limited appeal. Electronic communications soon became essential, at first to move advertising material around the country; however the application that enabled this wasn't exactly efficient.

ISDN was expensive and slow. "In those days there was one national advertising agency handling digital copies and so newspapers would dial up on their ISDN to get their national ads and of course nothing was ever simple. Even if you had a little public notice going in today's paper you had to wait for a full page for tomorrow's edition to get through the pipe before you got what you wanted and it might take an hour or more."

When he moved to manage the *Wairarapa Times-Age* newspaper in Masterton, a logical opportunity opened up to improve communications and cut the cost of transmitting files. In 1993 Davidson was finally convinced the Internet, although slower than ISDN, might deliver part of the answer. "We wanted Internet connectivity for the transmission of digital copies so that we could take on print jobs from all over the North Island. Creating our own ISP meant that we could rent out that Internet connectivity when it wasn't being used."

He was among the first to begin exploring alternative communications means for moving publishing files. Many people were creating their own content and sending it down the line enclosed within Adobe's compressed print-ready PDF format. "We were very early in this business and it was useful for the newspaper as well because it meant we didn't have to sit around all day waiting to print. We were able to make much greater use of our own printing presses." Davidson increased the jobbing side of the business from a couple of hundred thousand dollars a year to $2 million, printing real estate and motor vehicle publications across the North Island.

The original ISP purchased by the newspaper in 1997 was called WINZ, but when the Department of Social Welfare changed its name to Work and Income New Zealand it distanced itself by changing its name to wise.net.nz in 1999. As well as the jobbing work the ISP offered a handful of businesses and hundreds of home users the chance to access the Internet for their own use. Effectively ISDN had been superceded by an efficient Internet dial-up service.

Telecom's technology upgrades and lower tariffs were an obvious response to competitive pressure but it no longer had the ISDN market to itself. Clear Communications, now 100 percent owned by British Telecom, had launched ISDN in May 1996, and Telstra had introduced high-powered switching equipment for both primary rate and basic rate services. Clear had signed several business customers, and Telstra was conducting commercial trials and already operating trans-Tasman ISDN services. Telecom was definitely in catch-up mode.

ANYONE FOR SECONDS?

Telecom was doing a roaring trade in second telephone lines into homes and small businesses. In excess of 40,000 homes had taken up the option and about three times as many businesses, largely due to their desire to run Internet or fax machines while on the phone. At this time about 30 percent of New Zealand households had at least one PC. That was about on par with Australia, slightly behind the United States, which had 40 percent penetration, but way ahead of most of the world.[33]

While IPNet might have taken some of the pressure off the voice network, Telecom was still creating sparks across the industry with its attitude, steep pricing for ISDN – if you could get it – and favouritism shown to its ISP arm. Xtra was without doubt the leader in the ISP market with 45,000 customers by the end of 1997, but the industry was pretty miffed about the special treatment it was getting from its parent company. Xtra boss Chris Tyler had openly stated it was getting a better price on bandwidth than other ISPs. The Commerce Commission's decision that it was within its rights to do so did little to alleviate market frustration.

According to a 1997 survey by the Australian-based telecommunications analysts NUS, New Zealanders were paying too much for their phone calls, and our phone system was lagging behind the rest of the world. While toll charges had dropped dramatically over the previous five years – the cost of a phone call to New York, for example, had fallen 52 percent since 1992 – we still had the most expensive international toll calls and the third-most expensive domestic calls in the entire OECD.

The Ministry of Commerce concurred in its briefing paper:

> *... It is clear that, with regard to price of business, residential, mobile and leased line services, New Zealand is failing to achieve best practice standards as evidenced in other OECD countries." The price of key business items in particular – such as ISDN – was high compared to other OECD countries. And Telecom profit levels were extremely high, compared with other telcos around the world... Telecom's profits are the highest in the developed world, as a return on equity.*[34]

In the continuing debacle over ISDN tariffs, Communications Minister Maurice Williamson issued a 'please explain' notice to Telecom over its consistently high pricing. Its response wasn't satisfactory, and the minister suggested it had better come back with a better answer. "This is a perfectly legitimate example of where we're out of kilter with international comparisons. There's no reason for it, and we kill our chance of international competitiveness if high-speed data isn't made available to New Zealand businesses," he said.

Williamson was great at making the right noises about new technology, but less willing to make a fuss when the market asked where it was or why it cost so much. "Williamson can pour forth details of prices that have fallen, services that have improved. Usually these entail comparisons between the horse and buggy days when Telecom was a state monopoly, and the present day," said *Listener* writer Gordon Campbell. "Moreover Williamson gives big ticks to the deregulated system that he oversees in New Zealand. Yet prices have tumbled

Judith Speight, served as TUANZ chairperson for seven years.

worldwide in recent years, thanks to massive technology advances. To many observers New Zealand has seen benefits in spite of, not because of, the system. Given the nature of telecommunications and the need for competing networks to interact with each other – every other country in the developed world has some kind of regulator to ensure competition remains open and fair. Every other country sees danger in a situation where an incumbent can effectively set the terms and the pace at which its rivals can compete."

SLOWER THAN MOLASSES

While the carriers were holding regular meetings on how to interchange Internet traffic, the old bone of contention, 'interconnection agreements,' and an unwillingness to expose intimate details about each other's networks meant things were moving 'like molasses in winter,' to regurgitate a Maurice Williamson classic.

'Call waiting' and caller ID, which had been available in other markets for four to five years, were only just being introduced. Telecom had insisted on charging enormous fees for interconnection between networks and had released its controversial number portability proposals in 1997, which let people keep the same number if they changed networks. Telecom chairman Roderick Deane was naively optimistic a $30 entry charge and .5 cents a minute thereafter would be acceptable. Number portability was supposed to have been sorted at the time Telecom was sold. The offer, a decade on, simply added salt to the wound, but Telecom was in no mood for criticism. It reacted sharply to the howl of protest from the media and various industry groups. It felt it was being picked on and withdrew its membership of TUANZ because of a perceived bias.

ISPs were feeling like second-rate customers of the carriers, at a time when they needed to lift their game to meet increasing competition and the demands of their own customers, who were screaming for better service. In February 1997 Ihug announced it had been forced to stop signing up customers in the South Island due to delays in provisioning extra phone lines, a fault in circuits provided by Netway and a lack of national bandwidth. "Delays over the year have caused a loss of around $200,000 in initial earnings, with unrealised income from lost customers running even higher, we have calculated a figure close to $500,000," claimed Ihug's Tim Wood.[36]

Ihug had investigated options for satellite and wireless Internet delivery and became the first ISP to deliver broadband services. Through an arrangement with PanAmSat it began fast Internet services to 30,000 users in New Zealand and then ventured across the Tasman with its breakthrough approach. It was now transmitting 85 percent of its Internet traffic via satellite, with two 34Mbit/sec satellite feeds into Napa Valley in San Francisco to earth stations in Auckland, Wellington, Christchurch, and Dunedin and to Sydney, Melbourne, Brisbane, and Adelaide. Voyager installed its own satellite dish for better international links. Iconz , which already had videoconferencing and streaming video and was talking about voice over the Internet, brought three new Cisco boxes which each took 120 phone lines and announced grand plans to become a pseudo carrier. However by September 1998 Ihug and Xtra, unable to keep pace with the dial-up revolution, had booked up all new primary rate ISDN lines out of Auckland's Mayoral Drive exchange for the next six months. In fact the situation had become so dire Telecom had to stop accepting any new ISDN customers because it simply couldn't keep pace.

FIRST MEDIA COMES IN LAST

Worldwide developments are being led by telecommunications and cable television companies who want to use a single network infrastructure for sufficient capacity to deliver a full range of telecommunications, multimedia and interactive services to the home or office…In New Zealand Telecom is at the forefront of such developments. After running a cable television pilot for two years in the Auckland suburbs of Pakuranga and New Lynn, offering more than 20 channels, Telecom is rolling out cable to over 70,000 homes in Auckland and Wellington.
Telecom, 1996 annual report.

In 1990, the year Telecom claimed 'broadband' ISDN could be available to all New Zealand homes and businesses within five years, it embarked on a fatally flawed hybrid fibre-coaxial (HFC) cable trial, claiming it would deliver movies and fast data connections to 300,000 New Zealand homes.

The idea that pay TV, home shopping, and high-speed data services could be delivered over a single cable was not new. Even before the Internet became mainstream several US-based interactive TV and home shopping cable networks had crashed and burned.

Telecom announced its First Media project would go live in 1993 with a pilot in Auckland feeding about 600 homes with a wide range of programming. Its goal was to pass 70,000 homes within 18 months. Maurice Williamson, excited by the proposal this leading-edge service would be delivered to his electorate, was among the first in the country to have his home wired for the new multimedia era and had fibre-optic cabling installed. The minister and many of his neighbours subscribed to the multichannel First Media cable TV system, which Telecom finally delivered in a limited form in 1995.

It promised a full interactive service, complete with on-line shopping and video-on-demand. The roll-out began under the radar in Pakuranga and New Lynn. By August 1997 Howick and East Tamaki were getting the service and the diggers had been busy laying cable in Glenfield. Upper and Lower Hutt were nearly completed and First Media was adding other Wellington suburbs to its roll-out plan.

For First Media customers though, interactive meant little more than being able to push 'pay' on the remote and have a specific movie appear on your screen 'in a short time,' or buying into a new channel for the night. For home shopping First Media settled for Xtra's Internet-based Great New Zealand Shopping Mall, which it said would 'move to broadband in the future.' Visiting *Wired* magazine journalist Bob Johnstone was impressed with what he saw:

Unencumbered by line-of-business regulations or the need to file for approval, Telecom is jumping into all sorts of new markets. Since introducing a mobile service, the company has signed up 290,000 cellular subscribers, giving New Zealand one of the highest rates of cell-phone penetration in the world. "You see more flip-phones here than in Dallas," says John Clark, a 16-year US cable industry veteran hired to develop Telecom's nascent video business. Clark's initial responsibility is running two fibre-to-the-curb trials in Auckland. (One just happens to be in Pakuranga, Maurice Williamson's yuppie constituency, the other in a somewhat less upmarket district represented by the previous administration's communications minister. Telecom insists the choice of locations was a coincidence.) At present, the service

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delivers 22 channels of video, some basic and some delivered on a pay-per-day basis to 600 homes. A modest menu perhaps, but a veritable feast for New Zealanders, who receive only three basic over-the-air channels. (Five pay channels are available via UHF from Sky Network Television Ltd., a joint venture whose partners include Ameritech, Bell Atlantic, TCI, and Time Warner.) Such limited choice represents a unique opportunity for Telecom. "Nowhere else in the world," Clark claims, "is the telephone company entering into video where there is no cable competition there already."[37]

Meanwhile Kiwi Cable, which had been formed in 1994 on Wellington's Kapiti Coast, had invested $40 million in expanding its fibre network to pass 50,000 homes by the end of 1996, working closely with power companies to string up its cable. It was acquired by Saturn Communications, owned by Australian company Austar, which expanded its goals of providing cable TV, phone, and data services into greater Wellington and Christchurch. By the end of 1996 it claimed to have cable passing 80–90 percent of Wellington homes. It had invested $130 million in Wellington and with Canadian investment added another $30 million to maintain momentum for plans to cable 'other cities.'

Saturn had ten channels of home movies and planned another 30, including mainstream programming and community television by the end of 1997. As well as its pay TV business it was using its fibre backbone with coaxial cable to the home to deliver telephone connectivity and high-speed data. It had signed an interconnection with Telecom, enabling it to operate nationwide and planned a 10Mbit/sec data service from cable modems by August 1998.

Following a legal stoush with Sky after a failed Telecom buy-in, Sky content was no longer able to be broadcast across the Telecom-owned cable network. Sky took its own route. Having used up its nine channels on UHF, which it broadcast to 290,000 homes, it planned to beam in digital multichannel satellite-based pay TV. It let 9200 New Zealanders have access to one channel to see the All Blacks trounce Australia in the Bledisloe Cup and was talking about 40 channels for the launch of its digital network in April 1998.

As the pay television rivals battled to move to digital technology and enter the telecommunications business, communications minister and First Media subscriber Maurice Williamson was concerned Telecom's customers were missing out on some of the basics. "I'm disappointed that we've had fibre cable for nearly five years and there's been no attempt to provide cable modems. Australia now offers household connections to the Internet using cable modems, which are massively faster than your normal modem. How is it that they're so different? Why can't we have them here?"

Williamson's subscription enabled him access to more than 24 channels of television on First Media, including free-to-air channels, but none of the promised interactivity and fast data services. "I am disappointed with First Media since the first trial. It started with the Sky service but because of court action over who can do what, Sky still can't come to our house via cable. It's not likely to be resumed even though Telecom dropped its bid to buy Sky. The court injunction still stands. I find it very frustrating – the whole suburb of Pakuranga has fibre into the home and

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you can't get three or four of the best channels, including ESPN, and the sports network, unless they get a UHF aerial on the roof."

Graeme Mitchell, general manager of First Media, believed cable modems weren't yet standardised enough but thought they might be by the end of 1997 and admitted Telecom was still looking at ways to deliver fast Internet over First Media's cable system.[38] Before the end of the year though there was a new agenda. Telecom's First Media development and fibre-coax roll-out had slowed to almost stalling point and no one could figure out why. By July 1997 its focus seemed to have shifted to another covert technology.

The Opera (Organised Programme of Experimentation and Research into ATM) trial run by Telecom subsidiary Netway Communications in conjunction with the Tuia Society was the first confirmation that ADSL (asynchronous digital subscriber line) 'may provide viable higher speed access to homes.' The technology was used during the trial to link Opera across 1.5km of copper from Victoria Street to the Plaza International Hotel in Wellington. "We pulled down a Pink Floyd video clip over existing copper running at speeds up to 2Mbit/sec," said Telecom broadband product manager Phil Turnbull. "We're now convinced ADSL has a very strong future and are investing in further trials." He suggested ADSL would be ideal for last mile access into the home from cable television systems and could "definitely be used as infill media for services such as high speed Internet access."[39]

In fact Telecom had been looking seriously at ADSL as an overlay to extend the capabilities of copper wire in its telephone network for at least a year. It had installed switches in its Kandallah telephone exchange in January 1997, delivering 200 subscribers in the suburb a similar package of movie and TV channels to First Media customers. Telecom spoke of a commercial roll-out in March and was confident it would be able to deliver compressed movies and high-speed data services across the country, using existing telephone lines, by the end of 1998.

Telecom's group general manager of broadband strategy Vaughan Smith, said with digital subscriber line (DSL) the potential existed for First Media to have nationwide coverage. "All the pieces are coming together. It's still a little way off before the bandwidth can be delivered to the masses but the content is readily available. We can do everything we were doing with our HFC network but more cheaply. In the short term most people still really want movies and sports and over the long term we believe they'll get that off the Internet." Rather than having to have a decoder and cable TV in the home there would be a Web TV device.

"As part of getting ready for delivering broadband services to residential customers we've been busy putting fibre further out into our network. We are now in a position to roll out DSL as an economic solution to the last mile," he said.[40] DSL would be rolled out in a targeted fashion. "Customers are saying they want more bandwidth at more reasonable prices. We are now able to deliver that… One of the beauties of DSL is that we can do rapid deployment with relatively little effort. Say we've got 45,000 people hanging off most of our major exchanges – all we have to do is take a truck around ten exchanges and we've covered half a million users who will be ready to be wired up for DSL. All they have to do is

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call us and we'll provide the equipment; it's not a matter of digging up streets any longer," said Smith.[41]

In November 1997, two years into Telecom's massive cable-laying project, prime contractor Ericsson was told to pull the plug. The end of the line for the HFC cable roll-out came after passing only 68,000 homes in Auckland and Wellington at an estimated cost of up to $200 million. It had earlier claimed it wanted to avoid digging up the landscape again by placing underground ducting in city areas, so copper could be withdrawn and fibre-optics threaded in when there was the demand. Within a short period the cabling was being pulled from the ground and sold off. Some say the whole project was a stunt to undermine the efforts of the Kiwi cable company, later acquired by Saturn and then TelstraClear, others suggest Telecom's North American majority owners were planning to pull out, and it wanted to tidy up the books.

All services on Telecom's First Media network ceased on 31 July 1998. The court cases continued for two years as Ericsson's subcontractors battled to win back some dignity after many lost their homes, their equipment, and their livelihood.

DSL was now seen as the way to deliver high-speed services to the home by streamlining the capabilities of the copper-based telephone lines. The same month as the plug was pulled on the cable-laying project Telecom acquired 26GHz radio spectrum to help the bulk of New Zealanders access high-speed Internet and possibly digital television.[42] It was used for neither. After two years of testing Telecom introduced its JetStream DSL offering, but rather than delivering movies on demand it had chosen an Internet-only solution, which could adapt to varying line conditions. In many parts of the country the telephone lines were simply too old and worn with loops, joins, corroded connections, and electrical interference making it impossible to guarantee quality of service.[43]

DISRUPTIVE TECHNOLOGY

The carrier squabbles continued to slow the rate of competition but the pace of technology hadn't eased. Before ISDN had gained any serious grip in the market, alternative technologies were looming. While distracted for a time with plans to become a cable TV and HFC network provider, Telecom had been evaluating another technology that seemed promising.

It was thought from March 1998, depending on the success of Wellington trials, that Telecom and NEC would begin installing new DSL switches at exchanges around the country. Business would be targeted first but residences close enough to the 'business exchanges' would also have access. The new technology, everyone hoped, would slash data charges for existing dedicated lines and ISDN customers. Among the services on offer would be pay TV.

"I don't see much of a future for ISDN. It's too expensive for us. We try and pass it on to our customers at the best price we can but it costs us a fortune. These new solutions will offer much better price performance," said Telecom group general manager of broadband strategy, Vaughan Smith. "We've got a lot of increasingly frustrated customers out there because there just hasn't been a good solution at an affordable price. We think this will be fixed within the next 12 months. We're very optimistic. We're going to deliver a broadband network to as many people as we can."[44]

Telecom spent about $810 million in 1997 on new plant and equipment, including extending its fibre-optic and cellular networks and a contract to future-proof its entire network. According to Telecom's broadband and interconnection manager, Alan Holden, the current network would "eat itself." The old copper in the ground was coming to the end of its use-by date and modern business requirements needed a new fabric – a more flexible way to distribute and manage voice and data traffic. To that end Telecom invested $50 million in high-speed switches and ATM, a cell-based switching network, seen as the way of the future.

The decision to go with ATM came after a three-year trial across the country's academic backbone where Telecom sought to learn as much as it could about broadband networking. The Opera Network run by Telecom subsidiary Netway Communications in conjunction with the Tuia Society also provided vital information about the use of DSL and its performance over the copper wires of Telecom's network.[45]

Telecom signed a deal with Newbridge-Siemens in May 1997 for an ATM network capable of 155Mbit/sec–622Mbit/sec speeds. Several months later further investment was made to boost the capability to data speeds up to 20 gigabits per second. ATM, according to Telecom's Holden, was the beginning of the end for Telecom's old infrastructure, which would gradually be assimilated into the ATM umbrella. "ATM is the beginning of something quite big. It is the common transport switching system over which a large number of services are supported. Previously you had a lot of dedicated networks to service." Voice would be the last to move across.[46]

Businesses with big bandwidth requirements wouldn't be starved for choice as rival Clear already had an operational nationwide ATM network for 18 months. A number of customers including universities and ISPs were using its Stratacom switch to access speeds up to 155Mbit/sec.[47] Clear planned to spend a further $14 million broadening the coverage of its fibre loops in the main cities. The Museum of New Zealand, Auckland University, Fisher & Paykel, WCC, and Mercury Energy were just a few of the locations that already had successful ATM networks running to meet future communications needs. Telstra was also planning to build an ATM network.

In November Telecom further reduced charges for services including ISDN and leased lines, resulting in data costs coming down between 20 and 50 percent overall for the year. Clear responded in kind, announcing it would launch a basic rate ISDN service in 1988, drop its business analogue line rates to below the Telecom offering, and publish its ATM rate card. Finally the pressure was on to bring down the cost of business bandwidth, which would ultimately be fought at the high end, using fibre-optic networks. Clear would offer bundled services based around 65Mbit/sec circuits. Telecom, however, claimed it was only interested in selling full-blown 155Mbit/sec ATM, and Graeme Rowe, Telecom's marketing manager for connectivity and computer communications, believed the market was too immature to set tariffs.

While Telecom was saying leased lines remained more affordable for the bulk of businesses, Jane Hindle, Clear's manager of data services, insisted ATM was more affordable. "A lot of businesses do not use their dedicated circuits all the time and want a service that gives them bandwidth when they need it and for only a bit more to have a guaranteed bandwidth availability… By making the rate card public, ATM will no longer be viewed as an emerging technology but a real service that can be tailored to meet customer requirements."

The 20Gbit/sec boost to Telecom's ATM fibre backbone, the 26GHz frequencies it won at auction, and the 1Mbit/sec–50Mbit/sec capabilities of the DSL overlay to its aging copper network would according to the hype, finally give New Zealand a fast lane on the information superhighway. As usual time soon proved that these sunrise technologies and the promised benefits were a lot further off than originally promised.

WHAM, BAM, THANK YOU, MA'AM

It seemed the market was always crying out for more, but when questioned about why this wasn't forthcoming Telecom would counter by saying it would deliver the appropriate services "when the market demands." Someone wasn't listening, or perhaps the industry wasn't making a loud enough noise to stir the government into the action it had promised time and again if the big boys didn't start behaving themselves and learn to share the sandpit.

An analysis of the market in November 1997 by Paul Budde Communications stated our telecommunications services cost too much, with Telecom's dominant position allowing it to 'dictate terms and conditions' for competitors and raise prices, instead of bringing them down as in other deregulated economies. The fact was, without regulation or any government restraint, Telecom had acted like any business, fighting tooth and nail to keep its customer base, and in the end putting its shareholders ahead of its customers. It could easily have complied with all its competitor's requests but Telecom chief executive Rod Deane was not being paid $1.2 million to give away market share.

Telecom's reluctance to offer more broad-ranging services at better prices by suggesting the demand wasn't there was purely and simply a snow job. It was obvious that Telecom would continue to stall, delay, debate, and argue with Clear, BellSouth, Telstra, and anyone else over 'commercial issues' until it got the deal it wanted. In November 1997, just as real competition seemed to be emerging, both Baby Bell investors announced they wanted out.

New Zealand Herald financial columnist Brian Gaynor was among those miffed that the Americans had not only made huge profits from their short sojourn, but got away with under-investing in the core infrastructure. On close examination of the figures over their tenure he claimed the two American giants had not made a significant contribution to Telecom's profit growth. In the end the sale of Telecom to overseas interests probably had a negative rather than positive impact on the New Zealand economy.

In the modern world capital is easily transferred; it does not have emotional bonds. When overseas investors have maximised their profits, or found more attractive horizons, they get up and leave. The two North American telecommunication giants will have fond memories of New Zealand. They bought Telecom for a song in 1990 and have made a financial killing from the transaction. In September 1990 the New Zealand Government sold Telecom for $4.25 billion. The buyers were Ameritech (45 percent), Bell Atlantic (45 percent), Sir Michael Fay and David Richwhite (5 percent), and Alan Gibbs and Trevor Farmer (5 percent).

The timing of the sale was a disaster as far as New Zealand taxpayers – the previous owners of the company – were concerned. Telecom's earnings took off and in the intervening period it has reported normalised profits of $4.1 billion and paid dividends of $3.6 billion. In addition, the company has had a capital repayment of $0.5 billion and a share buyback of $1 billion. In other words Telecom has paid shareholders $5.1 billion in cash since September 1990 compared with the original purchase price of just $4.25 billion.

In terms of value-creation, Telecom has been head and shoulders above any other New Zealand company. For Ameritech and Bell Atlantic the investment has been extremely lucrative. Their combined 90 percent shareholding cost $3.8 billion yet they have received an estimated $5 billion from dividends, a capital repayment, share buyback and the sale of shares in the 1991 float and in 1992 and 1993... Thus the two American telecommunication giants will exit New' Zealand with an estimated total realisation, including dividends, of $11.5 billion, compared with the original investment of just $3.8 billion.

It is difficult to understand what either Ameritech or Bell Atlantic did to earn this huge return. Telecom's profit has improved substantially over the past seven years but this has been a world wide trend in the telecommunications industry. Telecom has a monopolistic position in many areas of operation and some of its new imported technology, particularly mobile phones, were not specifically acquired from its two major North American shareholders… It is difficult to justify the massive transfer in wealth to overseas interests when their contribution to Telecom's profit seems to have been fairly limited.[48]

While it was obvious Telecom had no moral imperative to pursue public good objectives, the government, which is in the end answerable to the people, certainly did. It was responsible for ensuring communications technology "is an engine of economic growth and job creation and a powerful tool for educating our children and expanding access to health care."[49]

After nine years of non-interference, the chief architect of deregulation, Richard Prebble, finally chipped in, admitting the government was supposed to be involved in the process. "I never imagined that the Crown would not be a party." He said litigation was a key element in his strategy, but Maurice Williamson had ignored his urging to have the attorney general join court action. As a result the courts didn't understand the Kiwi Share, put in place at Telecom's request to ensure equal access and pricing for residential customers regardless of where they lived.

What bothered many taxpayers and ultimately Telecom customers, was the years of rhetoric and unrealised consumer benefits, particularly in relation to data services. New Zealand was supposed to be the envy of the telecommunications world with its fully digital network, privatised phone company, and no rules. Instead of becoming a wired Utopia our national competitiveness was compromised in the vain hope that the free market would somehow create a beneficent pocket of self-regulation the world could admire. We thought we were special. We thought the world was watching and it was, but for other reasons. We were the guinea pig, a test case for telecommunications deregulation.

We had been subjected to the commercial equivalent of rape and pillage through the 'wham, bam, thank you, ma'am' methods of multinational investors while the government stood on the sideline, determined to keep hands off. We thought we were opening our doors to competition and investment but got shafted.[50]

ABOVE: "Telecommunications was made a Government monopoly on the advice of a government official to prevent the Electric Telegraph Company of Chicago from opening an exchange. The same employee then licensed the Western Electric Company, so starting a century of Government overcharging. The Western Electric Telegraph Company of course is a direct ancestor of Bell Atlantic and Ameritech who will each own 24.9 percent of Telecom," SOE Minister Richard Prebble, speech to TUANZ conference in Auckland, 7 August 1990.
TUANZ Archive.

9

Local loop languishing

Battling bandwidth blues

There's not much point having a Ferrari when you can only drive it down a country lane. The rest of the Internet is clogged up. Multicast movies and video-on-demand services which deliver content to the users hard drive will generate the interest. Nick Wood, director of Ihug, discussing future possibilities in 1999.

At the end of the 1990s it was apparent that New Zealand's pioneering pole position at the forefront of telecommunications deregulation was no longer something we could safely trumpet to the world. All the hype about the information superhighway bringing interactive services, endless information, and eleventy-one video channels to our homes appeared little more than a marketing myth. As the dust began to settle the harsh truth was being realised: most of us only had a dirt road for an on-ramp.

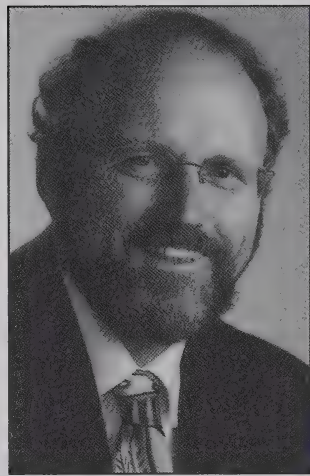
Telecom and Clear had made significant upgrades to their fibre-optic networks across both islands, with rings around the central business districts capable of gigabit per second throughput. However the race to provide competitive high-speed data services into residential communities was an idea whose time had not yet come.

To make a dent in New Zealand's deregulated market, competitors needed deep enough pockets to conduct ongoing legal battles and cover exorbitant interconnection costs while building their own infrastructure. Complaints about quality of service, obstacles to access, and the snail's pace journey to broadband had curbed our game. With a growing number of competitors in the ISP market, the focus was on survival and trying to grow and add customer value on increasingly tight margins.

The infighting continued between carriers over outstanding interconnection, billing, and numbering deals. Telecom was still complaining that its network was being overloaded with Internet traffic, while doing its best to keep competitors at bay and to delay the inevitable arrival of faster services, at least until it had the market edge. Instead of being applauded as the fine example of a deregulated market, New Zealand had become something of a laughing stock.

'The Knowledge Economy' report delivered to IT Minister Maurice Williamson from his own Information Technology Advisory Group (ITAG) in August 1999 claimed New Zealand was an

example of how a developed country had failed to make the transition to a knowledge-based economy. "We will end up an amusement park for the rest of the world on what not to do," said report co-author Professor Howard Frederick of Victoria University. The government must have a role in steering the country away from a commodity-based exporter to embracing e-commerce, he said. Instead of becoming a telecommunications centre of excellence, the benefits beyond cheaper toll calls had not been realised by the heartland of the economy, small to medium businesses.



Paul Budde, Australian-based telecommunications analyst.

Australian researcher Paul Budde agreed New Zealand had to lift its game or risk missing out on the economic benefits of the brave new digital world. There had been more changes in 1999 in the newly deregulated European countries, where former Telecom investors Ameritech and Bell Atlantic were now concentrating, than in New Zealand during the past decade. However, he said there were still plenty of opportunities for private data and voice networks to open up fast communications using local access technologies, which were plummeting in price.

Unlike Germany, Italy, and other locations in Europe, Asia, and the United States, where deregulation was now taking place, few alternative networks had emerged here. Budde said independent networks being built by Wellington's Saturn Communications and Superway on Auckland's North Shore were happening too slowly. "In Australia there are 12 companies building local loop infrastructures and inter-city lines providing physical competition. In New Zealand everyone still has to interconnect through Telecom." It was now possible to build a nationwide digital wireless network for an investment of $300 million. "Even six months ago that was unbelievable." Around the world independent providers with strong commercial backing were creating local phone companies with the support of governments who offered protection from monopoly players with the full support of the banking community.

SPEED BUMPS

Internet use among New Zealanders remained the highest per capita in the world, revealing our determination to make something of this empowering technology. However there was ongoing frustration at data access speeds, and the high cost of dedicated lines or fast access technologies, which prevented the use of audio and video, now commonplace on the Internet.

There was a major opportunity for competitors to bid for spectrum from the Ministry of Commerce auction and for Internet providers to develop their own local networks.

However Budde, author of the tenth 'Telecommunications in New Zealand' report, said some options to build local loop networks relied largely on unproven technology. Earlier in 1998 Formus International paid $2.4 million and Clear Communications $800,000 for high-speed frequencies to be used for local metropolitan distribution services (LMDS). The technology had not been commercially successful anywhere. "It's too complex. If they can't get it going in the United States with all the capital that's available there, then New Zealand is unlikely to outshine them within the next 6–12 months." Satellite services were another option but still "very much one-way technology," said the report.

Budde predicted tough times ahead as telecommunications service providers realised they could no longer compete on price alone. There would be mergers and partnerships with ISPs and

some players leaving the market altogether. The incentive, according to Budde, was research that showed people would happily double their spending on telecommunications if they could access video-on-demand, interactive digital TV, fast Internet, and other such services. At the end of 1998, he said, people typically spent around $70–$80 a month on telecommunications, and predicted that over the next five to ten years that would grow to $150–$200 a month as lifestyles changed. All this depended entirely on having the right infrastructure in place to deliver these services.[1] In 1988 more attempts to create an information superhighway were abandoned than completed, with several regional cable and pay TV operations failing and Telecom shutting down its First Media cable TV operation. Apart from Sky TV, Saturn Communications was the only important player, but it was not rolling out fast enough to make a difference.

Before committing beyond modem speeds, users wanted guarantees of bountiful bandwidth for their buck. At this point in New Zealand's Internet history, any suggestion of moving up to a 2Mb leased line would immediately hit the spreadsheet mentality. Leased lines were still mainly limited to 64 or 128kbit/sec or the use of ISDN. From Telecom, Clear, and other ISPS, that would still set you back a minimum of $200 a month, plus per-minute costs at traditional business rates. Leased lines sold by Telecom and Clear were about $300–$400 a month. Genuine fast Internet access was still some way off, although Saturn had established an inspiring model in Wellington, bringing TV and telecommunications services to cable subscribers. Satellite-based bandwidth from Ihug also showed promise.

When Telecom pulled the plug on its First Media HFC project it claimed it had found a less expensive technology in DSL technology, which would use the copper cable for data and delivery of movies. It soon became evident that the copper infrastructure was far from suitable for pay TV, so the newly branded JetStream service, when it was eventually released for public consumption, would be for fast Internet only.

When DSL failed to appear on the commercial horizon in a timely fashion, attention began to turn back to that other copper wire enhancement technology, ISDN. The advent of the 56kbit/sec modem had provided some competition, but ISDN was a fully digital service that worked over copper wire and fibre with full two-way transmission, unlike the DSL family of technologies, which had a narrower return path. Despite having major problems with its network when ISPs began using primary rate ISDN to help them connect their growing number of customers, it was now pushing basic rate ISDN to small businesses.

Telecom had failed horribly to get the price or business case right previously and was now actively pitching basic rate ISDN (2 x 64kbit/sec plus 16kbit/sec signalling channel) as ideal for telecommuters to connect back to the main office, for high-speed Internet access and moving larger files such as graphics. There had been several price reductions but these still created a huge obstacle to uptake and paled in comparison to other countries where ISDN was priced closer to normal phone services. Clear began delivering a basic rate service from June 1998, mainly focused on the business market. That gave Telecom further incentive to lower its prices. In August it slashed its basic rate ISDN installation costs from $350 to $175 in an effort to boost the popularity of the service.

CAN THE COPPER COPE?

Meanwhile the old infrastructure issues began appearing again. Even the latest 56k modems were proving sensitive to line conditions. If the copper cable had deteriorated (there was water on the line or subscribers were further than 3km from the nearest exchange) chances were the signal would be significantly impaired. Many of those who had been trialling DSL, allegedly capable of 6Mbit/sec speeds upstream, were at times only experiencing only 1Mb–2Mbit/sec speeds over the telephone lines.

Much of the reduced speed was attributed to the nature of the Internet and its bottlenecks, claimed Telecom, which was spending $35 million upgrading its copper network, mainly in Auckland. If the local loop, the 'last mile' of copper into our homes and businesses, wasn't even up to the challenge of delivering dial-up Internet how was it going to cope with widespread DSL? According to my own investigations into the state of our copper cabling, published in Auckland's *Metro* magazine in October 1998, throughput issues could arise because of the age of the copper in the overhead or underground twisted pairs, different grades of copper being used, and 'bridge taps' where copper was doubled back down the street.

I've chatted to a number of Telecom engineers and contractors about "our" copper infrastructure not only because my phone has been acting up but because I'm interested in whether enhanced services over copper will ever reach me in Te Atatu South. Much of the nation's wiring is at least 40 years old. Apparently back in the 60s Telecom got "a good deal" on some impure wire which is too thin to handle the xDSL copper enhancement services. I got a bit fed up with listening to talk back radio and static on my telephone line so I phoned faults. "I'm sorry all our operators are busy right now but if ..." Anyway the wall connection in the house was replaced "because the old ones tend to oxidise and create cross talk." The phone was also replaced.

The talk-back callers kept bleating on in the background so I phoned again on one of those rough weather weekends, just after Palmerston North, Masterton and parts of Auckland lost their phone systems. A contractor began testing cables and digging holes. He found an underground cable with exposed copper but that wasn't what interested me. The wire connectors under the grey PVC pipes at the base of the telephone poles were oozing green. 'How long before those connections fail?' I asked. "Give it a year," said the contractor.

Then we had a second bout of "weather" and all incoming calls gave one quick ring then died. Another call to faults revealed this was "a very common problem." The repair man found the "light gauge" copper wires in the ground outside had completely corroded and fused together. "It's supposed to have a 20-year life but Telecom wants 40 out of it. This stuff is everywhere, it's only 98 percent copper," he said.[3]

While the universities were now out of the game of providing Internet backbone services and were now using commercial offerings from the main carriers or ISPs for their networking needs, former Internet gateway manager John Houlker at Waikato University was still taking an interest in market developments. He was both impressed and concerned at Telecom's plans to deliver DSL nationwide. "I don't see how you can have an open and competitive environment when a fully integrated top-to-bottom communications company has the whole system plus the numbering plan. It was never going to be easy but having multiple companies laying several different cabling systems in each main centre is a huge ask for a country of our size. How on earth are we going to get lower cost communications," he wondered.

"In my view they should never have sold Telecom bundled the way it was. They're even doing it with the power sector too late. They should have made the division between the lines and the services before the local power companies were sold up from community trusts and local authorities. The Telecom lines should have been sold as a separate thing." He hoped high-end existing wireless frequencies owned by Formus Communications and Clear Communications and the forthcoming spectrum auction of at least 2000 regional frequencies, would give competing carriers an opportunity to bypass the local loop. "It could be the big hope for some real competition," said Houlker.[4]

TELECOM WEAVES NEW WEB

On the surface at least Telecom seemed to be having something of a change of heart. Instead of sidelining ISPs and doing its best to squash them underfoot – and many ISPs certainly claim to have felt the underside of its corporate boot – it appeared to be taking a more service-oriented approach. After all, ISPs were mostly Telecom customers, and their demands for higher level services and more bandwidth translated to a highly profitable revenue stream. And with new, faster services coming on stream, perhaps it was better to have a friendlier captive market than a renegade one that would look for alternatives at any cost.

Graeme Rowe, Telecom's marketing manager for computer communications, was given the unenviable task of turning the situation around. "All those ISP guys had the year before been in garages with ten telephone lines so the basics weren't even there. We were copping a lot of flak in the press. Most of it was relationship-driven, and most of it was driven by the aggressive attitude – or the high-growth strategies that ISG (Internet Services Group aka Xtra) was preparing at the time. We didn't have the right relationships with the ISPs, we weren't supporting them technically, we didn't have the right sort of infrastructure, there were credit management issues galore … so we had to change to adapt to the situation."

Telecom's goal was to introduce high-performing networks with high percentages of customers connected and to reduce the geographic barriers to connecting. "We set up structures and processes to deal with the ISPs as true and valued customers in their own right – whereas before we'd treated them as a few of the thousands of small businesses. We moved them into the corporate business where we got the technical resources to help them."[5]

Demands from businesses and Internet providers were coming thick and fast, along with complaints about price and poor service. But Rowe's comments seemed to be a veiled apology for the heavy-handed approach of the past, suggesting a more conciliatory approach was dawning. In late 1998 Telecom introduced IPNet, specifically built for the transport of Internet traffic and designed to relieve the growing pressure on the public telephone network. The new network overlay would deliver ISP traffic over a more Internet-friendly platform.

IPNet, initially trialled exclusively by Xtra for two months, meant no more toll calls. Rather than points of presence in each location to log on or toll calls to get service, ISPs who subscribed could now get their customers to call a single 0800 number for nationwide access. "IP is the network now. The platform itself has potential to do all sorts of things – it's going to be dial-up, ISDN, ADSL, VDSL, HDSL, wireless, satellites, paper cups and string if it works. That's what IP is going to be – not any one thing. I can honestly say most of our objectives have been met. We have the best Internet in the world. The network of any ISP here is significantly better than any you'll get in the USA. We have higher penetration and getting busy tones on dial-ups is rare," Rowe told journalist Russell Brown.[6]

IPNet was essentially 'managed modem banks,' directing traffic straight from the closest exchange to the ISP concerned, providing nationwide free calling. In her thesis paper 'Strategic Behaviour of Internet Service Providers' (2000), Christina Enright looked into the initial impact:

Many of the small ISPs continued to survive due to the lack of free calling options from the major ISPs outside of the population centres… A small number of new regional ISPs entered the market to fill under-represented market segments. Most provided low cost service with minimal customer support. Whereas most of the major service providers charged $2.50 an hour for Internet access, these new entrants charged as low as 40 cents an hour, but provided little or no customer support. For example, small Wellington-based ISP Paradise.net which opened in 1998 was charging less than 20 percent of Xtra's price schedule but had little access to help desk support or installation guidelines.

However, the dynamics of competition began to change as more ISPs purchased bandwidth on IPNet… The major trend in this period was that more and more ISPs began to offer data communication packages to businesses. Both national and regional ISPs listed ISDN service packages, and many offered leased-line services providing businesses with high-speed connections to the Internet. … Some resell services provided by Telecom or Clear, but many repackage their spare capacity to improve revenues. Many ISPs also began in this period to offer value-added services such as Web page design, Web page hosting and e-commerce facilities, targeting small business that didn't have this expertise.[7]

SAID THE SPIDER TO THE FLY

During the first half of 1999 a series of events changed the whole nature of competition among ISPs and gave Telecom the opportunity to assert a new level of control over the market. First was a move to flat-rate pricing, which triggered another round of price wars.

Typically New Zealand Internet access had been time-based – you pay for what you use – but a hybrid charging regime had evolved, offering limited megabytes for a monthly fee. Ihug (with an estimated 80,000 users) had been offering a $45 flat monthly fee for four years, with 60 percent of its customers using that option. In February 1999 in response to growing competition from Xtra and ClearNet, it doubled on-line time for its $30 Sapphire account holders, who could now stay on-line for 60 hours. Earlier Xtra had launched its Advance 20 and Advance 50 plans, which slashed the hourly rate to one-third of that offered by ClearNet. ClearNet then announced it would introduce a flat fee service from 8 June and to cope with expected growth in traffic announced a $2 million upgrade including more powerful processors for its front and back end systems, new switching technology, triple the number of modems, and enhanced firewalls and security. One day later Xtra, now with an estimated 180,000 users, came back with a $40 monthly rate and extended its entry-level options to include ten hours for $15 and 20 hours on-line for $25.

Fierce competition between the top ISPs meant a single monthly rate of around $40 for an 'all-you-can-eat' Internet access rapidly became the new industry standard. The new flat monthly fees allowed users to stay on-line for as long as they liked without incurring hourly or per megabyte data fees. Xtra general manager Graham Mitchell said an increasing number of people were spending more time on the Internet, and the new pricing meant they wouldn't have to worry about hourly charges. However he warned the new deal wasn't meant to encourage permanent connection to the Internet. Tim Wood of Ihug said it was inevitable the major players would move to flat-rate charging but warned their networks would quickly feel the pressure. He said some Ihug users stayed on-line for up to 700 hours a month, and a large number were connected 400 hours a month.[8]

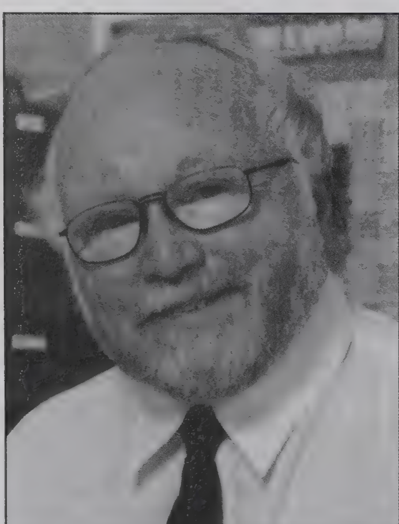
While this huge churn was going on and ISPs were trying to cope with a growing customer base that planned to spend longer on-line, Telecom dealt its trump card. In December 1998 IPNet had clocked up 87 million call minutes and been through a major upgrade after some users found they couldn't log on. Now, confident of its robustness, Telecom used its monopoly position as 'owner' of the local loop to force the entire Internet community to shift across to a new dial-up access network.

It gave ISPs and their customers six weeks to reprogramme their systems to the new 'overlay' network. Telecom claimed its public switched network was creaking under the strain of domestic Internet users hogging the lines and gave them until 1 August 1999 to add an 0867 access number to IPNet. Abstainers would face a two-cents-per-minute charge after an initial ten hours on-line per month, and if the network became congested Telecom reserved the right to take those users offline without warning. Business customers would continue to pay $4.55 a minute for IPNet unless they used special services such as ISDN or other data services.

Jack Matthews, TelstraSaturn chief executive. TUANZ Archive.

ISPs were outraged, believing they were being blackmailed into accepting the new regime, which they perceived as a commercial tactic, particularly when they were smack in the middle of a price war over flat-rate accounts. The 0867 deal also bypassed existing interconnection deals, depriving rival carriers of termination fees from Telecom. About 20 ISPs met in Wellington to consider legal action to extend the timeframe for compliance and won the backing of TUANZ.[9] Xtra customers weren't too worried: they'd already been on IPNet for months. Right in the midst of the chaos Xtra launched a major advertising campaign promoting its new flat-rate $40 access account. It signed up 9000 customers in the first week, confident it could exceed 200,000 users by the end of 1999.[10]

Ihug director Tim Wood estimated the shift to the new number would cost about $50,000 to contact his customers, revise letterheads, and send out new CDs so users could reprogramme. Jack Matthews, chief executive of Saturn Communications in Wellington, wasn't impressed either: "It is a blatant, transparent attempt to avoid paying interconnection when it suits them." Telstra and WorldxChange said the move had made them reconsider expanding their Internet services. Telecom insisted the move was solely to enable it to better manage Internet traffic, which was growing at such an exponential rate it was placing its voice network at risk. It claimed about 60 percent of all traffic on its network was now coming from the Internet.



Ernie Newman, TUANZ chief executive. TUANZ Archive.

INTERNET OVERLOAD

Xtra seemed blissfully unaffected by the turmoil and stood to pick up significant business as service providers struggled to upgrade to new access numbers imposed on the industry. TUANZ chief executive Ernie Newman was concerned Telecom was taking advantage of the situation while "the management of every other ISP in the country is going through a major restructuring."

Telecom had been talking about trying to reduce the load on its public switch network since 1998. It had also regularly spoken about the need to upgrade or replace its NEC digital switches at exchanges across the country to cope with the high demand from ISPs. The upgrades never went ahead, even though Internet traffic in mid-1999 accounted for more than 23 percent of residential local calls, up from 13.7 percent a year previously. It claimed the average length of an Internet call was now 22 minutes, compared to three minutes for an average voice call. The top one percent of Internet

users were clocking up more than 400 hours of use a month. In March 1999, 23.2 percent of residential local phone traffic was Internet based, up from 16.7 percent in April 1998. By 2002 it was anticipated the Internet would account for 35–40 percent of residential local phone traffic.[11]

Ernie Newman called on the government to urgently investigate Telecom's claim that it was running out of capacity. "Until now most people have assumed that Telecom, like other telecommunications companies worldwide, was progressively upgrading its network to deal with this." Telecom needed to explain why it wasn't prepared for Internet growth if the true reason was in fact network overload. "If however the move is commercially driven, that could be construed as a use of its dominant position in the local loop to drive a major industry change. This can only be to Telecom's commercial advantage, which raises serious questions about the use of that position, the adequacy of regulations and the role of government in ensuring independent ISPs and users are given a fair go."

In June 1999 Telecom had, under cover of the 0867 confusion, finally let its fast Internet service out of the bag. Its pricing and performance proved disappointing to many business and domestic users who were hanging out for a faster and more affordable on-ramp to the Internet. DSL, which allowed customers to simultaneously surf the Internet and talk on the telephone or send a fax, had been continually tested since January 1997. It now used Telecom's IPNet and users could stay on-line all the time without incurring time-based charges. But what if our aging copper telephone lines weren't able to sustain high data throughput? Well rural areas were definitely going to be a problem because any customer more than 3–5km distant from the exchange was going to get weaker signal. Based on its trial Telecom had reached a compromise decision to go with a 'rate adaptive' version of DSL, which would detect the condition of the telephone lines. It was capable of 7Mbit/sec into the home, but likely to prove a lot slower over most New Zealand lines.[13]

Xtra domestic customers using JetStream would pay a $299 installation fee (or buy a Nokia modem for $450) and an entry-level price of $69 per month plus modem rental ($119) for their speedy link into cyberspace. The service, however, charged 35 cents per megabit after the first 600Mb of downloading per month. Business charges were a lot higher. Telecom had upgraded more than 30 exchanges in Auckland, Wellington, Christchurch, Palmerston North, and Hamilton and planned a progressive nationwide roll-out. JetStream would operate to the maximum capabilities of the copper local loop network, estimated at 6Mbit/sec downstream and around 1Mbit/sec return path.[14]

Curiously Telecom had been beaten to the gun when a rival company launched its own version of DSL technology. Hamilton-based Lloyd Group delivered its commercial offering in December 1998. Telecom was miffed but allowed the service, warning, however, that there were no guarantees of quality and that it may have to drop the service if there was any interference on the line. Within a couple of months, just before Telecom's commercial launch, the entrepreneurial company was asked to desist and put its plans for a national network on hold. Telecom spokesman Glen Sowry said the service Lloyd Group was offering was "outside the specification of the circuit" designed to run at up to 3.4kHz. Telecom alleged Lloyd's equipment was running up to 90kHz and more and was "dramatically outside the band and risks interference with other services." Lloyd Group executive director Daniel Lee said Telecom had restricted his access to certain circuits, largely because it didn't want competitors in the DSL market. "We believe access to copper should be open to other competitors rather than them having to use Telecom's IPNet."[15]

Lloyd Group had been offering its DSL variation to businesses at industrial parks in Auckland and Hamilton and claimed to have entered technology and financial partnerships to extend the service across the country. It wanted to provide alternatives to digital leased lines at guaranteed 128 and 256kbit/sec speeds for a flat fee. Lloyd Group commissioned technical studies to prove its Hotwire DSL or MVL (multiple virtual lines) technology from Paradyne, created no interference

on the network. It alleged Telecom's own ISDN and xDSL technology created far more electrical interference. The case alleging anti-competitive behaviour was taken to the Commerce Commission, which was still dealing with complaints about Telecom's last minute network switch that was forcing Internet users and service providers to change their access numbers or face per-minute charging.[16]

While other ISPs were in discussion with Telecom about reselling the service, the only other fast Internet broadband service was Ihug's satellite and wireless offerings. Its StarNet service (400kbit/sec–2Mbit/sec), previously restricted to those within line of sight of Auckland's Sky Tower, was now available from Ihug's 14 points of presence around the country for $59 a month for 60 hours on-line and $69 for unlimited access. Customers also needed to buy $300 satellite-receiving equipment.

Telecom's 'broadband' launch provoked Ihug to revisit its pricing structure and get tough on its own Internet hoggers. The ISP put a data cap on high-use accounts, mass mailing its 1000 fast Internet users to advise them that from August they faced a limit of 60Mb a day download or 2Gb a month, and after that they'd be charged 10 cents per megabyte of traffic. The move was clearly aimed at about 20 heavy users who were downloading 1–3Gb a day. Irate user Wayne Moroney said he could easily download 69Mb in a couple of hours, often to get the latest game demos or the latest Linux RedHat operating system, which was itself about 400Mb. "They've done an about face and there's a lot of angry people out there," he said. The only option for big data movers was a business account at $168 a month.[17]

CATALYST FOR INTERVENTION

The IPNet-0867 debacle was far from over. The Commerce Commission complaint had become the catalyst to help shift the government from hands-off mode to taking a serious look at the existing deregulation model. The deadline for compliance with the 0867 switch-over had now moved to September 1999 but even some of those who had moved across were still facing difficulties. North Shore-based ISP Web Internet claimed issues with Telecom's 0867 had prevented it from a nationwide roll-out. Since moving to the service the company said its clients had experienced almost daily disruption, often resulting in its whole network crashing because Telecom had concentrated all its customers on one exchange.

The Labour-Alliance Government believed the 0867 mandate of a two-cents-a-minute penalty for non-confirming Internet users might be a breach of the Kiwi Share, which promised New Zealanders that local access to telephone services would remain free, and the cost of phone rentals would not rise faster than the cost of living. The deal was struck when Telecom was first sold off to US telecommunications giants Ameritech and Bell Atlantic. Commerce and Communications Minister Paul Swain said the 0867 issue needed to be tackled with urgency. Labour also promised a major review of the telecommunications market and the Commerce Act, which was supposed to cover competition issues. A cheeky claim from Clear that Telecom should be forced to split up its local network for use by competitors, in much the same way as Telstra had been asked to do in Australia, also needed sorting. Clear claimed Telecom was using its monopoly on the lines to limit competition.[18]

Under the original interconnection arrangement Clear, Telstra, and other carriers paid each other to terminate calls but under 0867 everything now went through Telecom. Clear refused to conform and mounted its own legal battle against Telecom while accumulating a huge potential bill at 2 cents a minute for every dial-in user. In the meantime it continued to claim 2 cents a minute for calls received from the Telecom network – something its rival was obviously unhappy about.

Further complications arose in April 2000 with the arrival of free Internet provider i4free, a customer of Clear. Telecom disconnected the newcomer on the first day of service. The upstart

provider had common directorship across a group of existing telecommunications companies but was depending on payment from Clear for calls terminated on its network to survive. Telecom insisted i4free was illegally bypassing its 0867 Internet access number and causing major overload problems at its main exchange in Airedale Street, Auckland.

Even though i4free changed its dial-in numbers, Telecom just as quickly disconnected them. When it became obvious i4free was facing difficulties, another Telecom competitor, WorldxChange, which planned to launch its own service, came to the rescue by offering dial-in numbers. Telecom cut those off too but immediately reconnected when it realised its mistake. Then the High Court stepped in. A mandatory injunction was served at the request of i4free, requiring Telecom to reconnect the numbers and restraining it from further disconnections until the matter could be sorted out legally.

However Telecom, believing it had sufficient grounds to challenge the decision, moved once more to disconnect, claiming the i4free service was putting its network at risk. A further urgent sitting before Justice Judith Potter reaffirmed the court decision ordering Telecom to leave the newcomer alone. In a weekend conference call Justice Potter extended the injunction, warning Telecom could not single out i4free or any other ISP, even if there was network overloading. Any restriction should be applied equally across 15 ISPs using its central Auckland exchange, including Telecom's own Xtra service, which now had 250,000 customers.

Justice Potter said she found it difficult to accept that Telecom did not have "the wit or the resources" to manage the situation at least until the matter came before the court for a full hearing. Queen's Counsel Jim Farmer, representing i4free, insisted Telecom's claims of the imminent collapse of its network "defied any sense of credibility" as his client was only handling about 500 simultaneous calls compared to about 8000 for competitors such as Ihug. The dispute further emphasised the two industry allegations that Telecom had failed to invest sufficiently in its domestic network to prepare for the growth in Internet traffic, and the two-cents-a-minute penalty on domestic dial-in customers who didn't use Telecom's new 0867 prefix was a breach of the Kiwi Share.

INDUSTRY GANGS UP

Initially i4free had circumvented the new numbering scheme by redirecting all traffic through the Clear network, claiming there was nothing in its agreement with Telecom prohibiting this. It said any attempt to prevent the service going ahead would be a breach of the anti-competitive clauses of the Commerce Act. Clear joined i4free in its battle against Telecom and offered to support the newcomer if it ran into financial difficulties and to help battle any counterclaims arising from the court case.

The free Internet provider was backed by directors of National Mail, Attica Communications, and CallPlus, including Malcolm Dick, an experienced telecommunications pioneer and one-time senior Telecom executive and his partner, i4free chief executive Annette Presley. The couple claimed the business could pay its way through advertising revenue and commissions for on-line sales. It hoped to achieve 100,000 customers by Christmas 2000. Initially Telecom won itself some unlikely supporters in its wish to crush the free opposition. Ihug moved to block its 65,000 local customers from accessing the i4free site, claiming it was 'an aberration' and the service encouraged users to leech off the back of existing players for email. Within days Ihug removed its block after users threatened to lay a complaint with the ISOC for breach of conduct.[19]

Through all this the Commerce Commission continued its preliminary inquiry to determine if Telecom might be in breach of the Commerce Act, with three official complaints having been made about the unilateral move forcing ISPs to change their access number. It admitted the issue was a complex one, but became convinced Telecom had breached section 36 of the Commerce Act, relating to the use of a dominant position in the market to exclude competitors. It took Telecom to court where it faced potential fines of up to $5 million if found guilty.

Telecom claimed the new dial-in numbers were outside the traditional interconnection agreements signed with rival carriers including Clear. Clear alleged the move automatically wiped out an estimated $25 million in interconnection revenue but struck an out-of-court settlement with Telecom in June 2000 and agreed to use the new number.[20] Telecom also reached an agreement with Telstra Saturn over 0867 access, which it claimed had helped correct any distortions caused by the dramatic growth in Internet traffic. Meanwhile the High Court had ruled that Telecom must allow free Internet access to domestic users as part of its Kiwi Share obligations.[21]

Telecom, however, wasn't going to take the Commerce Commission's decision to take the matter to court lightly, claiming it was totally out of step with current developments in the telecommunications market and extremely unhelpful. Industry services manager Greg McAlister said it would only rake up history and undermine the ongoing Telecommunications Inquiry process, which Telecom and other industry players fully supported. "We will vigorously defend any proceedings brought by the Commerce Commission. Telecom has always taken its legal obligations very seriously… It is unsatisfactory to have this kind of enforcement a year after the event. The Commission is very much behind the game."[22]

Those challenging the 0867 changeover included Ihug. Former director Nick Wood viewed the whole debacle as a set-up by Telecom to get everyone across to its new IPNet. "They had lost control of the market, they got caught with their underpants down by the free ISPs and had to play catch-up. They had to wait until they could deliver DSL to build up their customer base and gain back everything they lost in the dial-up market. They pinned Clear into a corner. Then Clear misled the guys from Slingshot when they created i4free and then basically killed it off with their own i4free service and using tromboning to get around having to pay the 0867 two cents a minute fee."

Ihug was losing money hand over fist and went to Finance Minister Bill Birch and to the Commerce Commission to try to put an end to the craziness. The only alternative to taking court action itself was to accept an invitation to sit down in a room with Telecom. "We negotiated a way

to avoid all this readdressing where people were getting two cents a minute for calls, working out a deal to move across to the new network and cover lost revenue based on a fraction of a cent. It could have been up around $70 million if the cost was based on two cents a minute but we settled for $16 million over three years. Soon after that Telecom dropped its ISP charges significantly. That whole thing nearly brought the whole Internet to its knees, a lot of people lost a lot of money and the industry got really hurt," said Wood.

Telecom remained convinced it had acted properly and in the best interests of customers but the court case went ahead. It was to have been heard in the High Court in Wellington on 11 September 2000 but continued to be deferred. Ironically the Commerce Commission court case alleging anti-competitive behaviour actually came to trial in the Auckland High Court seven years later in August–September 2007, with former key individuals from Telecom and the ISP community called as witnesses. Some were flown in from the United Kingdom and Australia. The judge reserved his decision.

ANOTHER PRICE WAR

Late in 2000, voices railing against the 0867 move had been silenced, mainly because everyone was now using the number. Clear found an interim solution, agreeing to pay Telecom $35 million in a one-off deal negating any outstanding court cases and 0867 charges and covering projected termination fees for all voice and Internet traffic over the next 12 months.[23]

From August ISP prices were being forced down again from a $40-per-month flat rate to an average $25 flat fee for dial-up, precipitating the second major price war in just over a year. Many providers now had start-up accounts as low as $10 a month and tens of thousands began to take up enticing offers from the newly arrived free providers. Xtra continued to dominate the market, having grown 49 percent in 2000 to over 320,000 subscribers. Xtra now accounted for about 42 percent of the market, well ahead of its closest rivals ClearNet and Ihug. On-line-numbers had reached critical mass, which meant e-commerce was now more viable than ever before. Depending on which survey company or corporate research you believed, somewhere between 35 and 40 percent of New Zealanders, two-thirds of them home users, had Internet access.[24]

Wireless technology was beginning to provide some relief for those seeking fast Internet – mainly businesses – with a number of parties, including Walker Wireless and Clear, offering fixed services. An arrangement between Telecom and Clear in October 2000, which tidied up outstanding interconnection and legal issues, gave Clear access to the local loop with talk of a rival DSL service by March 2001.

It seemed the whole telecommunications market was reviewing, reinvesting, and repositioning; Telstra was looking to extend its presence; its first step was purchasing former Victoria University ISP NetLink. It had acquired a mobile telephone frequency, was providing bandwidth for several ISPs, and was working with Telecom to provide local loop access. In fact by now it was one of Telecom's biggest customers. It was first tipped early in 1999 that Telstra was keen to take a shareholding in Clear. Clear's earnings had been in steady decline since 1995. It claimed it had so far spent $400 million on its network and since the British Telecom buy-up, announced it would invest a further $120 million for the 2000 financial year in fibre-optic cabling and extending its LMDS wireless network closer to the nation's businesses.

Meanwhile Telecom was in the process of becoming an Australasian company, buying 78 percent of AAPT, Australia's third-largest telco, and by December 2000 had raised its shareholding to 100 percent. AAPT owned all the ILMDS frequencies put up for auction in Australia in 1999. Along with other players, Telecom was keen to get its hands on the five New Zealand-wide frequencies bought

by Denver-based Formus Communications at auction for $2.5 million. Formus had serious intent for the Australian market but wouldn't extend to the A$60 million paid by AAPT and pulled out of both markets. Speculation was rife that if Telecom clinched a majority shareholding in AAPT and convinced Formus to sell its Kiwi frequencies, it would be in an ideal situation to roll out a high-speed wireless network across the country to complement its DSL service. Waiting in the wings were new-generation cellular services in the 2GHz band, once the government worked out a deal with Maori interests, who were contesting ownership and management rights. Also on the list for future bandwidth provisioning was TVNZ-owned BCL, which had begun hawking a fast Internet offering to various ISPs.

Saturn Communications had stuck to its knitting in Wellington despite being engaged in a head-to-head battle with Telecom overpricing plans specifically targeting its customers..Its cable roll-out had been inhibited by the lack of teeth in the Commerce Act, allowing Telecom to match its prices on a street-by-street basis. Now with $100 million from its parent Austar to expand into Auckland and Christchurch, it was looking like a serious competitor. Saturn invested $240 million in the Wellington roll-out of its network and claimed a penetration of 23 percent of homes within its network coverage. Users paid $93 a month for a full-service network, including pay TV, voice, and fast Internet.

Then at the end of 1999 Australia's dominant carrier Telstra shocked the market by entering a partnership with Saturn, promising a $1.2 billion spend-up on a nationwide broadband network covering 65 percent of homes and 80 percent of businesses. The renamed TelstraSaturn promised to lay fibre loops in the main business centres, deliver wireless links to outlying regions and leverage independent local and international undersea cable with 120Gbit/sec capacity. At last it looked as though there was a formidable opponent to Telecom and that true competition would finally arrive in New Zealand.

The new carrier, owned equally by Telstra and Saturn's Australian parent Austar United, was a deal seen by some as payback time for Telecom after it had invested in Telstra's rival AAPT. TelstraSaturn was cocky to say the least. Saturn chief executive Jack Matthews compared the new company to a Formula 1 race car against Telecom's Model T. He said customers could expect savings of between 20 and 40 percent over existing pay TV and telephone providers. In Wellington Saturn customers had access to 50 channels including pay-per-view and free-to air as well as fast Internet via cable modem and a full telephone service.

TelstraSaturn was planning to lay undersea cable – 48 fibres, each capable of 2.5Gbit/sec – from Auckland to Wellington, and on to Christchurch, completely bypassing existing backbone networks owned by Telecom and Clear. Fibre would be installed throughout the central business districts of Auckland, Wellington, and Christchurch with residential broadband access offered in Auckland and Christchurch. Trans-Tasman capacity owned by Telstra would be used to link with Australia, with links to the rest of the world provided through Telstra's new Australia-Japan submarine cable.[25]

The billion-dollar TelstraSaturn commitment was to have been the largest investment in infostructure by any telecommunications competitor since the New Zealand market opened up a decade previously. It came on the eve of a major review of telecommunication by the new Labour-Alliance Government, which appeared determined to break Telecom's stranglehold on the market.

SORTING OUT THE SOCIETY

The ISOCNZ clearly had a lot on its plate, taking over the responsibilities previously handled by Waikato University at the Internet gateway and getting its wholly owned Registry company Domainz operating efficiently. Its second chairman, Jim Higgins, employed Patrick O'Brien to get Domainz up and running, which in itself resulted in several years of wrangling with the Internet community over the new charging regime for domain names and concerns that Domainz was a monopoly business.

These were volatile years, with Telecom's ongoing divide-and-conquer tactics, anti-competitive issues being investigated by the Commerce Commission, the government review of telecommunications and industry-related court cases. This was complicated further by huge changes in the ISP community and the burgeoning growth in the number of Internet subscribers.

The desire of ISOCNZ to get involved in more pressing issues of local Internet governance wasn't helped by legal cases over trademarks and domain name hijacking that involved both Domainz and ISOCNZ, strong debate over the technology to handle domain name registrations, and international challenges to global Internet governance, including how country codes might be managed. All the while ISOCNZ was dependent on a core group of passionate volunteers including many of the same faces who had been driving Internet development along from year dot.

ISOCNZ had managed to rise to the challenge, making numerous contributions on issues that fell within its mandate. In July 1996 Professor John Hine made the society's first submission on the Technology and Crimes Reform Bill, by former ISOCNZ chairman Roger Hicks. The society expressed its concerns that the Bill in its current form did not address the technologies it was attempting to legislate, making parts of it impossible to comply with or enforce. It was seen as inconsistent with attitudes and controls on other forms of communication, and ISOCNZ claimed it would soon need replacing as its basic premises were overtaken by new technology and international events.[26]

ON-LINE CONSULTATION

Using the Internet to streamline and open up its decision-making system to the wider Internet community seemed a worthwhile objective. In 1997 ISOCNZ developed conduct guidelines for running email meetings, based on what it had learned internally. These guidelines were then made publicly available. Mark Harris championed what became ISOCNZ's pioneering e-participation process.[27]

Early in 1998 it also weighed into the debate about cryptography, claiming the government's hard line was hindering the growth of e-commerce. It was opposed to laws preventing New Zealand companies from using strong cryptography in products without obtaining a licence from the government for each individual sale. This restriction had proved completely ineffective in keeping strong cryptography out of 'the wrong hands' and was significantly hindering the growth of electronic commerce, which offered, the society believed, great opportunities to New Zealanders. The international agreement under which cryptography export was controlled was up for renegotiation and the society was pushing for liberalisation.[28]

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Later in the year policy committee chairman Jenny Shearer and ISOCNZ chairman Jim Higgins wrote to Prime Minister Jenny Shipley requesting the government remove cryptography export controls from the Wassenaar Arrangement, essentially aimed at controlling the trafficking and sale of arms and military grade computing to unfriendly nations, and oppose any attempts to introduce further domestic controls over.[29]

By 1998 it was clear ISOCNZ needed to sort out its own internal affairs, look more closely at how it was being perceived by the community it was supposed to be serving, and put things on a more stable business footing.

As the 1990s dawned Sue Leader gained a certificate in business computing and while researching a case study on Cardinal Networks and America Online (AOL), was first introduced to the Internet. Despite being shocked at the cost – $25 for half an hour for access, another $25 for access to the service plus $1 to view a page, and $2 to download – she was hooked.

Sue Leader the Internet Society's first chief executive.

As a member of Women in Technology she furthered her interests in the on-line community, especially in relation to empowering women in business. She rejoined the Computer Society and became a member of ISOCNZ in 1995. Her computer and Internet training business in Tauranga had her involved in teaching Internet skills to Tauranga District Council and library staff. In January 1997 she was elected to the International Federation of Business and Professional Women (BPW), sitting on its networking and communications technology taskforce and chairing several committees.

TWO BOX FILES AND A SMILE

In May 1998 Leader was elected New Zealand vice president of BPW, with the new technology portfolio. Then two weeks before she was scheduled to run a two-day Maori Women's Welfare League workshop as part of a UNESCO project she had tendered for, she was appointed for an uncertain but challenging 'administration' role with ISOCNZ. She was given time to complete the project; ISOCNZ sponsored the Internet connection and Actrix sponsored the web site.

When she arrived to take up her new position in mid-August 1998, ISOCNZ chairman Jim Higgins handed her two box files and a folder, 'the existing infrastructure.' Her first council meeting came eight days into her contract. "I ended up with 11 action items: take over the web site, prepare constitutional amendments for the November AGM to allow for on-line participation at AGMs, write a paper on creating the new category

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of corporate membership, prepare a membership benefits paper, work with the Education and Research Committee on seminar to take place before the AGM, prepare a budget for 1999, write a letter of acceptance of a councillor's resignation, and take over the financial and membership services which were being done by New Zealand Computer Society. The work got even more varied and interesting as time passed."[30]

Her new role was more like being a self-employed contractor with a three-month deal that kept being rolled over. This gave the society more flexibility during a time of uncertain income. Apart from having a part-time contractor helping with the routine financial bookwork, Leader had to be Jill of all trades for many months. "If the councillors couldn't get to it, I did it. It was very much an evolutionary role, and could have developed either into a general secretary type position or a chief executive role." It developed quickly into the latter.

"Domainz lent me a desk for a couple of months, and I brought my own PC in until we could afford to buy a machine. By October I had found an office in a spare room at Actrix, for which they charged a modest rental and donated Internet access and Web hosting. Then we purchased a desk and a laptop." Leader said the society ran on her credit card until it could establish credit ratings around town. "Seeing as how we owned Domainz, businesses wouldn't allow them to vouch for us."

As chief executive Sue Leader frequently put in 90-hour weeks for the first 18 months. "I was getting paid to be part of making history. It was exciting and I loved it, but none of this could have happened without the voluntary contributions and countless hours of input by so many others." Council was effectively in session 24 hours a day, seven days a week, largely because of the extensive use of email mailing lists to conduct business. Until December 1999, the maximum honorarium was for chairman Jim Higgins who got $8000. The secretary and treasurer received $5000 and committee chairpeople received nothing for their efforts until December 1999. "Ordinary councillors received no honoraria; no one expected different and no one was unhappy about it."

A NEW INDUSTRY VOICE

One of ISOCNZ's first efforts to canvas industry views around wide-ranging issues came through public on-line consultation to establish the need for anti-cracking/hacking legislation in January 1999, ahead of creating a working group and making submissions on the proposed legislation.[31] It also sought industry feedback ahead of the 1999 elections to better understand the political issues relating to Internet that needed addresssing.[32]

ISOCNZ again stepped into the fray in June when the 0867 and Kiwi Share issue was top of mind. Jim Higgins, Don Stokes, and Sue Leader put a series of questions to Telecom so it could establish a market position. "We got written replies from Telecom, fed the answers back to public list and then conducted an on-line poll to establish ISOCNZ's position on the issue so that lobbying could continue, commencing with media releases and eventually meeting with the Kiwi-Shareholder Hon Bill Birch and then senior officials from Ministry of Commerce," said Leader, who claims Telecom changed its original charging intentions as a result of the process.[33]

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ISOCNZ was asking the government to make clear that the Kiwi Share applied to all local calls, not just those which Telecom decided on. It had sought a ruling on whether the Kiwi Share included data calls or was limited to voice calls only, as Telecom was asserting. "Our position is clear – we believe that Telecom is wrong to attempt to exclude data calls from Kiwi Share and we oppose any such suggestion. Kiwi Share guarantees free local calling for New Zealanders," said chairman Jim Higgins.

10

Diminished capacity

Whose foot is on the hose?

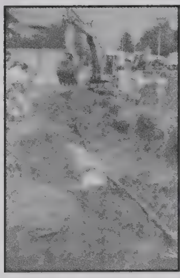
> The number of Internet hosts worldwide rose 67 percent in 1999 to surpass 72.4 million hosts by the end of the year. There were more than 30,000 newsgroups, around 80,000 mailing lists and at least 25,000 Internet relay chat sites where participants can type back and forward to each other in discussion forums. According to the Internet Software Consortium (ISC) New Zealand had the third highest registration rate of Internet hosts per head of population behind Finland and Norway with 271,000 registered domain names. This reflected a registration rate of 7765 per 100,000 people; the third highest in the world, behind Finland and Norway.
> *Internet News*, 14 February 2000.[1]

During New Zealand's formative century governments financed roads and streets, rail networks, universities, schools, a national airline, a health system, banking, postal, and broadcasting networks. It also established electricity and telephone connections to every home.

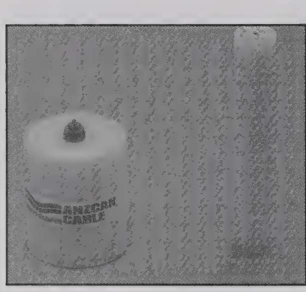
They'd seen the future and planned ahead; New Zealand exceeded all expectations for a nation of its size and prospered. At the turn of the next century, however, we were still fumbling around with the information revolution as though it was an optional extra rather than an essential social and economic driver.

Major telecommunications companies and investment houses were behind a variety of plans to girdle the globe with gigabit-speed networks, but the two main undersea fibre-optic cables connecting New Zealand to the world were booked up, and there was a growing sense we were being left behind. No technological forecaster or planner had foreseen the exponential uptake of international bandwidth fuelled by the Internet. Local surfing wasn't necessarily where the backlog was; this was often relatively fast to load. It was the international content New Zealanders spent 70 percent of their time surfing that was proving costly for ISPs who had to pass on those costs.

Telecom had 26 competitors in the voice market but very few in high-speed public data networking and even fewer offering international bandwidth.[2] Satellite transponders into and out of New Zealand were booked out unless you had prior arrangements. In 1999 Telecom admitted its Internet gateway had reached capacity and added an extra satellite circuit to compensate. That

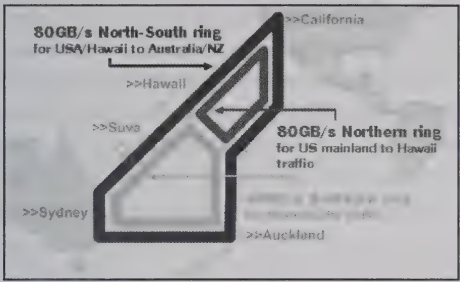


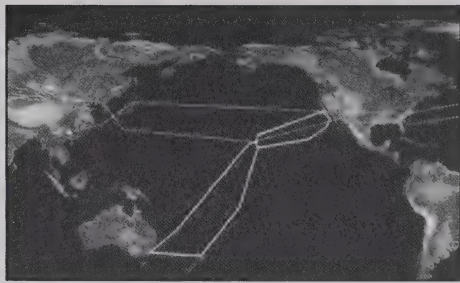
ABOVE LEFT: From ship to shore. The Takapuna end of the ANZCAN cable to Norfolk Island being buried with half-pipe protection on 17 March 1983. Photograph: Dave Hercus.
MIDDLE: The ANZCAN cable ready to be bought ashore at Takapuna beach on 17 March 1983 with beach cable rollers in position. Photo: Dave Hercus.
ABOVE RIGHT: TASMAN 2 cable landing. Stopper rope being attached to a bulldozer to pull the cable up Muriwai Beach towards the manhole connection, December 1991. Photo: Dave Hercus.

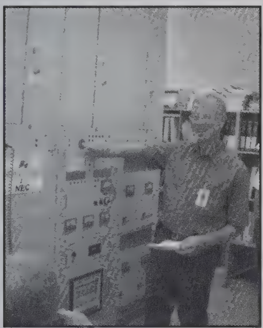


ABOVE LEFT: Comparison between ANZCAN cable (44mm) and Southern Cross (44mm).
ABOVE RIGHT: Cable end of Auckland-Hawaii PacRimEast cable coming ashore at Takapuna Beach, November 1992.
Photo: Dave Hercus.


ABOVE LEFT: The Southern Cross comes ashore at Takapuna Beach, 5 September 1999 having been fed along the ocean floor by the ship innovator. Photo: Southern Cross Cables.
ABOVE RIGHT: The Southern Cross cable landing at the Spencer Beach, Hawaii, on 9 September 1999. Photo: Southern Cross Cables.







ABOVE LEFT & RIGHT: Cable capacity continued to be used up as quickly as it was provided with the Tasman 2 and PacRim East cables soon giving way to the Soutern Cross Cable which itself was forced through several major capability upgrades almost as soon as it came on line.

LEFT: End of the line. After 18 years of fault-free service, the off button for the ANZCAN cable to Norfolk Island is pushed by Telecom engineer Dave Hercus at Takapuna cable station on 1 March 2002.

move and plans by other major carriers came too late to prevent both official America's Cup Regatta web sites being hosted offshore and several entrepreneurial web sites relocating their content to the United States.

As a nation of early adopters, New Zealand had aspired to be at the leading edge of the digital age – not forgotten at the bottom of the world, once more lamenting the tyranny of distance. It was clear by now from our rapid Internet uptake and our fast adoption of computing and cellphones that we thrived on any technology that placed our ideas and innovations at light-speed distance from Silicon Valley. However the cost of international bandwidth to New Zealand was proving to be a massive overhead and many ISPs were desperate to find cheaper alternatives. "Until we get a bulk boost of bandwidth into this country you are going to get a lot of flat-rate providers who can't provide the needed level of service or reliability," said Iconz technical manager, Tony Wicks. The options for offshore connections to the bulk of US Internet content were limited: Telecom's Netgate, Xtra for budget providers, offerings from Telstra and Clear and the pre-booked satellite-based bandwidth.

In July 1999 there were murmurings in Internet newsgroups and from various ISPs that performance at Telecom's Netgate Internet gateway had taken a dip. One ISP claimed it had only been able to drive data circuits at 60 percent capacity because of overloading. Certainly the latest ISP price wars triggered by Xtra were having a major impact on Internet use. Telecom's total outbound capacity through Netgate, used by most Internet providers, was only 45Mbit/sec. It admitted through spokesman Glen Sowry that it had been aware for some time there would be capacity issues and had introduced additional satellite capacity from Commsat. Satellite bandwidth was being widely and successfully used by Optus and Telstra in Australia, and Ihug locally, and would be cheaper than terrestrial access for ISPs. "We're confident satellites can meet the demand," said Sowry.[3]

Several local ISPs had their own capacity but by far the biggest provider was a family business that had rapidly evolved from running an Internet cafe in downtown Auckland to full Internet service and bandwidth provider to Australia and New Zealand. Ihug supplied bandwidth to about 90 ISPs in Australia claiming an overall capacity of 150Mbit/sec. The Wood brothers had seen the problem coming, claiming Telecom should have been better prepared before offered flat-rate access. Telecom's move was a knee-jerk reaction to Clear going flat rate. "Flat rate places a significant call on your services," said director Nick Wood. Ihug had been offering flat-rate access for four years and had built robustness and capacity into its systems.

ENTREPRENEURS GO OFFSHORE

New Zealand had led the world in bringing in Internet traffic via satellite and making requests for data via undersea cable. While commending the entrepreneurial efforts of some providers, including Ihug, for finding their own solutions, Ramin Marzavini, principal with Sydney-based www.consult, said there was no point in complaining because ISPs knew it was a tough business. "ISPs knew what the costs were before they got into the game and if they find it's a bad business they should get out of it."

Marzavini's company had been monitoring international Internet traffic and use patterns with a probe in Auckland, making 4000 telephone calls per month to determine the performance of local ISPs. While recent complaints suggested New Zealand access speeds were half those in the United States he said, performance was actually only 10 percent slower. That's primarily because of the amount of cable, the number of connections between here and the United States and the practices of some ISPs. He claimed some were putting 'a collar on dial-up access to control maximum speed to the United States. Xtra in particular skewed the download statistics because it limited the speed at which its users could download US files, he said.[4]

Having cut their teeth on dial-up speeds, New Zealanders were looking for the next level of experience beyond the worldwide wait, according to Sydney-based telecommunications consultant Paul Budde, who confirmed high-speed Internet access was definitely the next wave. "Approximately 20-25 percent of commercial Internet users were willing to spend between $15 and $30 extra for higher speed access. Typically the service was around $100 a month when it is first offered but you only get 1-3 percent penetration. When it gets down to $30 a month you will get 20-25 percent penetration. People want high-speed access and they don't care how they get it, but it must be at the right price," said Budde. Wholesale prices for Internet bandwidth were coming down and that was a major factor, particularly for the international backbones, which still took 80 percent of the traffic from Australia and New Zealand. The next step was to ensure those savings didn't go direct to the pockets of carriers and ISPs but were passed on to users.[5]

Inspired by all the talk about multimedia integration and information superhighways,s Kiwi innovators were developing software and systems that led the world. But they soon realised the essential infostructure they had been promised hadn't kept pace with the hype. Craig Meek, managing director of Auckland multimedia developer Terabyte, was convinced a lack of international bandwidth was stifling the use of new media applications and the growth of e-commerce. He likened the situation to having a high-pressure hose inside the country and only a garden hose going out. Terabyte was attempting to trial its breakthrough technology for the Louis Vuitton Challenger Series web site and media centre in mid-1999. It was surprised to discover the maximum outbound traffic New Zealand could handle was no greater than 100Mbit/sec for the whole country – not much more than many business networks. Gigabit per second speeds were required if servers in New Zealand were to handle the millions of hits generated by such a major event as the America's Cup Regatta.

Scott Mathais, managing director of the Parnell-based ITVworld.com (formerly Matcom), had become frustrated with trying to operate a new media business in New Zealand. The company, which provided a streaming-video news magazine on technology issues, had 40,000 viewers a month and was planning an exit to Sydney. He warned businesses intending to use a lot of video or audio content on their Web pages to host their sites offshore to avoid New Zealand's bandwidth bottleneck. He said New Zealand Internet consumers were being held over a barrel, and if the country didn't act quickly it would never catch up. "New Zealand is an impoverished and undernourished Internet community because of what hasn't come of Wellington. We're dealing with people in the United States who have larger pipes than the whole of New Zealand. We have a controlled situation here where the key players are extracting as much as they can from the Internet community." Ironically his company was handling content for a number of export-based web sites including the New Zealand Tourism Board.[6]

Bruce Simpson, creator of the 7am.com and Aardvark news sites, had already moved his sites to the United States simply because there wasn't enough capacity to cope with the demand for his content. "Because high traffic means high cost, the USA became the only way to stay in business." Simpson claimed there wasn't sufficient bandwidth to support early-evening Internet use, while the industry continued to grow at a frantic pace. "I fear we may have a real Internet Y2K problem on Jan 1, 2000, not because of bugs in the software, but simply because our pipes are too small." As well as the usual surge of traffic from new PC owners going on line at Christmas, "every man and his dog from all corners of the globe will try to tune into the various Web-cams around New Zealand at sites set up to promote our 'first into the new millennium' status."[7]

ESCAPE ROUTES JAMMED

Indeed what would happen as global interest increasingly focused here through the America's Cup, and the fact we were about to become the world's lab rat as the zeroes joined up at the end of 1999? This was the logical location to determine whether the Y2K domino effect had begun.

Telecom, roundly criticised in the past for failing to invest in its infrastructure, seemed to be waking up to the dilemma and instead of short-term solutions was beginning to look at the long-term picture. It had targeted $750 million for upgrading and extending its network, including $160 million for new international links to help clear the traffic jams. Its 50 percent shareholding (along with MCI WorldCom and Cable & Wireless Optus) in the 29,000km Southern Cross cable due to come on line from January 2000 was enough to promote a glimmer of confidence with a potential 200Gbit/sec capacity between Australia, New Zealand and on to Hawaii and California. However Southern Cross, first announced in 1998, wasn't due to go live until just ahead of the 2000 Sydney Olympics.

Clear Communications had its own Internet gateway, the Clear Internet Exchange, and a relationship with Telstra to handle all Australian-bound traffic as a back-up if it needed to re-route traffic. Late in 1999 it had about 40Mb of international capacity into the country and had signed off on an extra 4Mbit/sec for outbound traffic, including cable and a deal with Intelsat for satellite capacity. Clear had a fibre-optic loop around the country but still needed to link through Telecom to get the majority of its telephone customers talking to each other.

Telstra was a shareholder in both Tasman 2 and PacRim East cables; it had less than 100Mbit/sec and opted not to buy into the Southern Cross cable. Voyager, now wholly owned by MCI Worldcom, the world's largest Internet backbone provider, had satellite capacity to spare and access to the Southern Cross cable. TVNZ had discussed accessing its own international data circuits for pay-per-view streaming video over the Internet from its web site. However it had

backed off in case it contributed to further overloading of the national backbone and Internet gateway. Wholly owned subsidiary, infrastructure company BCL, obviously had access, but it wasn't keen to make this available beyond meeting the needs of its parent.

Telecom continued to increase bandwidth at its Internet gateway and ultimately replaced NZGate with an international IP service known as the Telecom Global Gateway, including Usenet newsfeeds and secondary domain name servers, which would also be made available in Australia. The new 'gate' would have nodes in Los Angeles, Palo Alto, and Auckland. IP routing would be handled by Cisco GSR 12,000 routers.

By March 2000 NUA Network Surveys claimed 304.3 million people around the world were now surfing the Internet; around 5 percent of the global population, including about 70 million in Asia-Pacific. Alongside Singapore, New Zealand had the highest user ratio in the region. By May there were more than 80 million domain names, or unique Internet addresses. The Internet Software Consortium said New Zealand had 271,000 of those; the third-highest per head of population behind Finland and Norway. With traffic doubling every 100 days, IDC Research was predicting 500 million people, or 11 percent of the world, would be on-line by 2003. The Web featured over six billion pages of information.[8]

INQUIRY CONFIRMS MARKET CONCERNS

In February 2000 the new Labour Government announced a ministerial inquiry into Telecommunications that would ultimately amend the Telecommunications Act 1987 with new stipulations, based on the hard lessons of the previous 13 years.

Acting minister of communications Trevor Mallard said the inquiry was vital the development of the information economy. The Australian Government and virtually every other OECD country had adopted a hands-on approach to telecommunications deregulation while New Zealand had principally left the resolution of competitive issues up to the courts.

Mallard was concerned the existing environment made it difficult for new entrants to get a foothold because it did not provide the necessary competition to bring prices down. It was clear Telecom had acted anti-competitively, and through its imposition of the 0867 access code for ISPs, effectively improved its market share. The review would examine the Kiwi Share, which guaranteed free local calling for residential customers, network access and interconnection, the numbering plan, and bundling of competitive and non-competitive services.

The review team, headed by former Fletcher Challenge chairman Hugh Fletcher, included lawyer Cathie Harrison and Allan Asher, deputy head of the Australian counterpart to New Zealand's Commerce Commission. They were asked to report back on the best possible regulatory regime to ensure New Zealand was globally competitive and got the full benefit of the information economy. Following public submissions a final report would go to the government by the end of September 2000.[9]

SOCIAL RESPONSIBILITIES

In a timely announcement, Telecom, complying with the government-mandated Telecommunications (Information Disclosure) Regulations 1999, declared in September that the Kiwi Share or

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Universal Service Obligation (USO) was costing it $167 million a year. The initial government estimate had been around $25 million.

When the final Telecommunications Inquiry report was delivered in October it was seen by many as a compromise with its wholesaling approach. It had failed to open up the local loop or provide any encouragement for regional networks to fill in the gaps where Telecom claimed it had 'unprofitable' customers. The Inquiry however did make it plain that New Zealand needed more competition and that Telecom would not be easily able to squirm out of the social responsibilities outlined under the Kiwi Share without a fight. Recent legal cases and the report clearly stated that Internet provision was included in that agreement.

The Inquiry also chided Telecom for not keeping its rural network up to the level required to enable equitable Internet access for that community. Major investment was required. Telecom and its investors were not happy. It had railed against the report, labelling it heavy-handed and backward. However TUANZ chairperson Judith Speight insisted the proposals were in fact at the 'light-handed extreme' of the OECD and would stimulate investment which has been stifled for over a decade.[10]

Soon after the Inquiry report was released, the heartbeat of the local sharemarket, where Telecom was a key player, went into arrhythmia. Share prices dropped lower than they had for many years. In what appeared to be a knee-jerk reaction to prevent further panic and pacify Telecom, Finance Minister Michael Cullen reassured Telecom investors there would be no heavy-handed regulation. He released a statement that one of the report's key recommendations, the appointment of an independent electronic communications commissioner, would not happen and seemed to dismiss industry-specific legislation for telecommunications.

COMMISSIONER CREATED

In its response to the Inquiry, the government in December 2000 announced the key features of the new regime designed to ensure delivery of cost-efficient, timely, and innovative telecommunications services on an ongoing, fair, and equitable basis to all existing and potential users. It established a telecommunications commissioner within the Commerce Commission with the powers to resolve disputes over key services. The immediate role would be to enable pricing and access obligations to be set for interconnection with Telecom's fixed telephone network; wholesaling of Telecom's fixed network services; and number portability, including 0800; specifications for fixed to mobile carrier pre-selection on Telecom's network; provision for the telecommunications commissioner to make recommendations to the Minister of Communications for regulation of other services in the future; and the upgrade of the Kiwi Share to provide data capability to virtually all New Zealanders (9.6kbit/sec to 99 percent of residential lines and 14.4kbit/sec to 95 percent of residential lines).

It announced plans to establish an Information Society Initiative to facilitate a partnership between government, industry and local communities to promote the information economy in New Zealand. This included consideration of issues relating to access of bandwidth in New Zealand.[11]

As laser-light-speed communications criss-crossed the globe like a skein of wool, the demand for bandwidth was skyrocketing around the world. Despite patchwork efforts to keep ahead of the curve, demand continued to outstrip New Zealand's infostructure capability. By mid-2000 close to 50 percent of New Zealanders were estimated to have Internet access and there was still no sign of the Southern Cross cable. According to Ovum research, broadband Internet capacity was expected to grow 100 percent a year to 2006. In the United States domestic broadband access, 2Mbit/sec and upwards, was a mainstream social phenomenon and the government was determined to keep pushing the boundaries. Michael Butcher, the president of international operations for leading equipment supplier Lucent, said more than US$1 trillion would be spent creating the telecommunications environment of the 21st century. He estimated NZ$446 billion of that had already been spent in 2000, much of it on submarine cables.

Telstra's Millennium Network, a robust 2.5Gbits/sec fibre-optic ring for video, audio, data, phone, fax, and mobile services, had already spread from Sydney across Australia using enough cable to circle the earth 37 times. However when Bill Gates visited Australia in September he was disappointed at the slow roll-out of high-volume, low-cost communications and surprised at the lack of broadband initiatives. He warned lack of high-speed Internet access could leave smaller nations in a permanent backwater. If he thought Australia was slack, Gates would have been appalled at the digital divide already evident in New Zealand. Although Clear, Telecom, Telstra Saturn, and 20 or so competitors were planning to spend $4 billion between 2000 and 2003, they were mainly focusing on the CBDs. Those who had, were about to get more.[12]

CAPACITY CONCERNS CONTINUE

As expected, Southern Cross was a waiting game. It had faced its share of challenges since it was commissioned and needed to be repaired three times, including in 2000 when a Russian ship dragged its anchor at the entrance to the Sydney Harbour and cut the cable.[13] The $2 billion cable was expected to meet New Zealand's international communications needs for at least two to three years, delivering a 120-fold increase in bandwidth capacity – enough to transfer a 780-metre-high stack of typed documents or two full-length motion pictures every second.

Despite capacity concerns, Southern Cross couldn't have arrived too soon. It began to restore confidence to those trying to compete in data services, and the larger ISPs, who were rapidly learning that to survive they must provide much more than dial-up and fast Internet. They needed to reinvent themselves as carriers with a range of services that could cope with the convergence of voice, data, and video with robust billing, Web development skills, Web hosting, on-line software rental, e-commerce services, and attractive content to keep customers coming back.

The first commercial traffic began to flow from 15 November 2000. Shortly after the cable came ashore at Takapuna Beach near Auckland, it was clear the allocated 40Gbit/sec capacity was insufficient to meet the nation's growing needs. Upgrades were planned early in 2001 and towards the end of the year, to extract the full design capability of 120Gbit/sec. Further growth in demand would mean the cable's capacity had to double by early 2003 using dense wave division multiplexing (DWDM) technology. Of course 50 percent owner of the Southern Cross cable, Telecom, made the most of the capacity from day one, which is largely why it was virtually booked out.

The market was getting tougher. The number of ISPs had dropped to around 60, with 20 or so having failed in the 18 months to the end of 2000 while others had merged or been acquired. Only those who were cash rich and technically geared for growth would survive the pressures ahead. Those pressures included the new wave of entry-level users who had been enticed onto the Internet by the free ISPs who had sucked all the profit out of low-end dial-up access and email.

And Telecom hadn't softened its stance on competitors now that rival ISPs were definitely in that category.

David Dix, founder of KC Internet Services, had brought considerable business Telecom's way as he on-sold his technology services supporting other ISPs and set up Internet access for businesses. In 2000 he found the once-helpful Telecom machine was no longer co-operative. "We'd order Telecom services on behalf of a customer and then Telecom would go direct and offer them a bundled deal. We realised that even though we were getting Telecom a lot of business they had no loyalty to us. We constantly complained but they didn't give a damn," he said.

He swapped to Telstra and initially found it had better business ethics until its management changed to include 'fast business guys' and the co-operation vanished. "Netway, a Telecom subsidiary, always tried to tie us down to fixed-price, long-term contracts but anyone who tied themselves down to a year capacity needed their head tested. Someone else always brings on a few more gigabytes of bandwidth. I remember when we were paying $72,000 a month for 512kbit/sec of international capacity from Telstra in 1999. A couple of years later you could buy that capacity for $1500 a month."

PRESSURE FROM FREEBIES RESHAPES MARKET

Many old-school ISPs, backyard start-ups and even those who had managed to accrue a strong dial-up customer base could never hope to compete against the bigger operators or the onslaught of free Internet providers unless they rethought their business models.

The introduction of Telecom's IPNet, providing free calling nationwide, had quashed the competitiveness of many of those who had previously been aggressive in the main centres. Among the casualties by mid-2000 were Binary Brothers, Deep South, Gig Internet, KT Internet, Meridian, Professional Internet, Sky Surf, Stripnet, Strongnet and Zipnet. Others, particularly those with a loyal customer base and Web development and IT skills, were absorbed by bigger players.

Smaller providers needed to find a successful niche if they were to survive; for example one Hawke's Bay ISP began offering microwave point-to-point fast Internet services using unlicensed radio spectrum, to bypass Telecom. Electrical retailer Genesis Energy, which serviced 170,000 homes and businesses across the North Island, was offering its Infogen unlimited surfing service exclusively to its customers for $10 a month. Auckland-based e3 (pron: 'e cubed') introduced its $10-a-month deal. The company, managed by Virtual ISP, was keen to pick up dissatisfied 'free' Internet users and offer them something more reliable.

There was still impressive growth in subscriber account numbers but the 80/20 rule no longer applied. "These days it's much more extreme, with six percent of the ISPs accounting for about 94 percent of the market," said IDC researcher Patrick Pilcher. The top five ISPs in 2000 were Xtra, claiming over 300,000, ClearNet, with more than 150,000 and Ihug, estimated at more than 100,000. Along with Paradise.net and Voyager they accounted for the bulk of the market. Beyond the top ten, subscriber numbers dropped dramatically.

FAST ACCESS OPTION

Most of the top 10 now offered a fast Internet option, typically Telecom's leased line, ISDN, and JetStream DSL services, although Ihug had its SatNet

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and ultra, fast Internet wireless services and Paradise.net was offering cable modem access through TelstraSaturn.

Xtra still had a home-user focus but was now branching out into the SOHO (small office, home office) market. Clear focused mainly on business customers. Voyager, owned by OzEmail and its US parent UUNet, although about to be taken over entirely by MCI Worldcom, was offering voIP and also had a strong business focus.

Paradise.net was started in 1995 by Shane Cole on an IBM PC under a coffee table in his flat, with a couple of modems hanging off it, and had become a nationwide provider using Telecom's IPNet. Cole astutely managed Paradise.net by offering quality of service, good technical support, and little downtime. It grew by word of mouth and ended up being sold to TelstraSaturn for $30 million in 1999.

CompuServe, number one in the market until the Internet went mainstream, was now run by Fujitsu, and remained in the top ten only because many multinationals had settled on the service worldwide. Its strength was providing cutting-edge business news. Wellington-based Globe.net, run by Lou Peron, was fairly early to market with a flat-rate offering. Asia On-line (formerly Iconz) tried to be the Swiss army knife of ISPs with something for everyone, but had shifted its sights to more influential and profitable accounts with focused services and products. Others figuring in the Internet top ten were Orcon Internet and Web World. Close contenders for a place in the top subscriber status included Actrix, AT&T, Planet, Earthlight, Netlink and Igrin.[14]

END OF THE IPNET CASH COW

The six free ISPs that had entered the market from about mid-1999 were finding it tough. They no longer had access to funding from termination fees once IPNet became compulsory, and had to cut a commercial deal with Clear to host them. As expected some of the less viable businesses began to falter. In fact free Internet had caused a major shakeout, sparking massive churn between providers as new and existing subscribers looked for the best deal. That not only confused the statistics but made survival more difficult for smaller ISPs. The free providers insisted that 50–80 percent of their sign-ups were defecting from existing providers, but few of the pay companies would admit to having lost customers.

The country's first free-access service was launched in October 1999, offering 20 hours on-line free to customers of financial services company, Electronic Publishing, based around the FreeFunds web site. Anyone who signed up for a unit trust investment, life insurance scheme, or mortgage was entitled to the 20 free hours each month. FreeFunds barely lasted a year. In March 2000 Surf4nix entered the game but in the first week of November it also bit the dust, and encouraged its 2500 customers to move to i4free. SahilNet, a late arrival, quit offering free service in October 2000 after interconnection payments ceased to flow from Telecom's coffers to Clear and on to them.[15]

In December 2000 Clear announced its Zfree service had reached 250,000 registered users and it would no longer take new customers. This was partly due to the interconnection deal it had signed with Telecom – and it claimed it wanted to ensure Zfree's quality was maintained with the network capacity currently available. Clear's customer cap was in essence the death knell for the

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free providers; others soon warned of worsening quality of services or simply admitted they'd done their dash. The second largest player, i4free, warned customers of ongoing deterioration, and suggested they join its new Slingshot service for unlimited access, which included up to 5Mb for Web pages and seven email addresses for $15 a month. Executive director Wayne Toddun was annoyed service provider Clear had reneged on promises for greater coverage and capacity.

At the heart of the matter was the $35-million deal between Telecom and Clear to settle their outstanding interconnection and legal issues. "Clear used our minutes to negotiate a flat-rate agreement for the next 12 months," effectively leaving i4free out in the cold. "We're astounded by the behaviour of Clear and Telecom after previous promises were made to help extend the services now they've completely let us down. We don't mind commercial deals being done. What we don't like is being lied to," said Toddun.

Between June and December 2000 data traffic on Telecom's network was going through the roof. According to Simon Moutter, Telecom's network group general manager, Internet traffic was growing at 75 percent year on year and other data traffic, mainly business based, was increasing 64 percent annually.[16] Web surfers were no longer satisfied with simple text and a smattering of images – they wanted the whole multimedia experience including fat graphics, moving images, and sound. The Internet had become the conduit to download an endless array of software, streaming audio, MP3 music files, and video clips. The transition to more complex content was becoming too much for even the 56kbits/sec dial-up limits of high-end modems. On-line shopping meant catalogues, credit card authentication, and security, all of which were driving greater demand for broadband services.

Initial high-speed Internet options had been too costly for most home users or even small businesses, but as prices came down demand for speedier accounts was escalating, reigniting concerns about access to the local loop. Clear in particular was concerned there had been no provision in the Telecommunications Inquiry for unbundling the local loop, an issue it considered pivotal for the delivery of competitive DSL services. The Inquiry had required Telecom to make DSL available at a wholesale rate to its competitors. It had already agreed to deliver DSL access to Clear, but there would only be a 7 percent margin for it to carve out a business. Unless Clear had equitable access to the local loop it would stay out of the domestic market.

CLEAR FAILS TO DELIVER

Meanwhile Clear had to sort out some of its own dirty laundry. Network failures and slack accounting practices dating back a couple of years were coming back to haunt it. In 1996 marketing and business consultant Simon Riley, Actrix founder John Vorstermans, Iprolink founder Craig Anderson, and Robert Hunt of Plain Communications formed Pronet, an alternative frame-relay-based Internet backbone to deliver alternative backbone bandwidth across the country. Pronet had points of presence in Auckland, Napier, Palmerston North, Nelson, Christchurch and Dunedin, servicing ISPs and corporate customers.

"Telecom's Xtra had just come into the market with a big splash and ISPs were already going through a major growth phase so the question was, how are all these guys going to stay in business?" said Riley. Through its overall buying power and the exemplary IPNetworking skills of Craig Anderson,

Pronet offered more control over the wholesale national and international bandwidth links. From around 1997 the company began to deal exclusively with Clear; in fact it soon became one of Clear's biggest customers. "Clear realised it couldn't get into a price war with Telecom and while offering us the same price, we knew they would at least try harder for us," said Riley.

In the end Clear's failure to deliver on its contractual promises of quality of service put Pronet out of business. "They had a series of major outages, not just for hours but for days over a period of about two months which put a lot of people at risk. All our upstream customers were saying, 'We can't live with this.'" Pronet was forced to shut down and ended up suing Clear Communications in the High Court in August 2001. "The impact on our business would have been very difficult to recover. It was a bit like an airline strike when all the pilots go on strike; you never get that business back," said Riley. Pronet won its lawsuit but Clear had counter sued, both results cancelling each other out.

In fact the three-week trial ended up being something of a case study for the industry, with several law firms and consultants citing the judgement in public presentations as a warning against bad business practices. Pronet sued for $4.6 million but "Clear was fortunate that the judge could wade through lousy pre-contract and contract paperwork and limit liability to $99,000," said barristers and solicitors Wigley & Company. In its contract Clear had promised Pronet 99.8 percent availability measured over 90 days. In the end it was revealed Clear had not taken reasonable efforts to provide a high-quality, reliable service.

The only thing saving Clear from having to pay the full amount was its contractual limitation on liability. "The judge had quickly concluded that reduced performance was enough for there to be 'unavailability'… packet loss, slow service and increased error rate meant the service was unavailable even though traffic could get through," said Wigley & Company. Clear was looking to counter sue for $250,000 arrears in fees in its defence of the case. "Poor paperwork can create unnecessary problems for defensive debt recovery."[17]

Meanwhile in his 'Telecommunications and Information Highways 2000' report, Paul Budde insisted Telecom had again been under-investing and infrastructure in New Zealand was not sufficient to meet the government's dream of taking the country into the frontline of the global e-economy. He said, there was an unmet demand for affordable high-speed access with 20–25 percent in the residential Internet market and 80 percent in the business Internet market requiring such services now. He suggested Telecom's monopoly was likely to continue until 2006 largely due to the government's failure to open up the local loop to competition.[18]

TUANZ chief executive Ernie Newman said proper competition had not been allowed to emerge because the of the sheer size, and power of the incumbent's local network, in particular the local loop, which had deterred new entrants and the emergence of full competition. "Certainly it has slowed down Saturn's development of the market, kept Telstra back through the carrier re-billing issues of 1999, and after ten years Clear is a shadow of what it might have been if it had been able to enter the market with a level playing field," he said.

Newman was adamant that urgent action was needed on full local loop unbundling (LLU). "Wholesaling is simply a rebranding, an accounting convenience. It won't create a situation where there is maximum opportunity for new technologies to emerge. With unbundling a new entrant can directly attach its equipment to Telecom's lines." With wholesaling, he said, the entire roll-out decision of broadband was in the hands of one company which had a lot of competing priorities for its capital expenditure programme both locally and offshore. "If they are not facing competition on the local loop why would they give priority to investing in that area?"[19]

Meanwhile Telecom, which had led the world by running its IPNet parallel to its existing public switched network, was at last looking to move its own network into the 21st century. It had been investing about $500 million a year on the network with capital expenditure focused heavily on its

data business. Now it claimed it was finally making an effort to replace its NEC NEAX exchanges, which had been struggling for years to cope with voice traffic, ISDN, and dial-in Internet. Other investments in the heart of its network were geared to benefit its more lucrative customers. In early 2001 it was upgrading its core ATM backbone network with a multimillion-dollar investment in new switches and management software to ensure greater robustness for larger corporate customers. The core network was being boosted to provide 'carrier class' IP traffic to meet the growing demand for dedicated 2Mbit/sec circuits and frame-relay services.

Telecom was spending up to $20 million on 'rehabilitating' the rest of its network by either replacing or upgrading copper in rural and other areas where there were coverage issues. It had plans to extend its JetStream DSL offerings for home users and small to medium businesses. By March 2001 it had around 12,000 customers, with the service available at 82 exchanges and within the reach of 700,000 subscribers. Once it sorted out its billing problems it would be able to comply with Telecommunications Inquiry requirements that it offer wholesale DSL to other providers. Clear was already piloting its DSL service using Telecom's lines, with manual billing until Telecom got its automated billing system together.

ON THE FENCE

The arrival of the Southern Cross cable and Telecom's commitment to improving its core communications meant the focus was back on the local and not-so-local loop. While the Internet was helping to close the gap between New Zealand and the rest of the world it had also opened up a new kind of distance between town and country, rich and poor and those with and without fast Internet.

There was little evidence anyone was making a halfway decent attempt at providing high-speed Internet to 'unprofitable' outlying suburbs, small towns, or the rural sector. Even so-called competitors preferred to cherry-pick the CBDs and high-growth areas. Telecom had admitted to the Telecommunications Inquiry that it had under-invested in its network, and agreed to make further investment to achieve a minimum of 9.6–14.4kbit/sec speeds for outlying and rural areas. This would require at least $100 million. Ironically the generally accepted Internet access speed at the time was 33kbit/sec, but ensuring everyone got that speed, Telecom said, would cost it $550 million.

It wanted proof that its lines weren't up to scratch and was now complaining that conforming to the Kiwi Share agreement, to continue supplying free calling to residential New Zealand, had cost it around $186 million to December 2000 – $18.7 million more than for the previous year. It claimed an increasing number of residential customers were costing it money, largely due to Internet use. It alleged 471,000 customers were costing it $400 each in rural areas and places where there was a high cost for upkeep of the network. Under the new legislation before parliament, Telecom's competitors could be liable for one-quarter of any losses sustained through the Kiwi Share agreement.[20]

If there had been any real substance in the hype of the past decade New Zealanders would by now be fierce competitors in the knowledge economy, regardless of whether they operated from a Queen Street high rise, a rural home office in Oamaru, tucked away in the bush at Coromandel, or a bach at Piha. Overall investment in telecommunications in New Zealand had been below the OECD average for most of the decade – virtually stagnating in 1999 at 1 percent growth compared with the international average of 7–9 percent. Close to $5 billion had been invested in the telecommunications market since deregulation but little had been done to decentralise the benefits. Neither of the major carriers had plans to move beyond high-density domestic, commercial, and industrial areas. The same applied to wireless providers and several independent wholesalers who now had their own CBD fibre. Telecom still dominated and fiercely protected the last mile of copper to the majority of homes and businesses.[21]

GRASS-ROOTS SHOCK

Concerns about the rural sector being left out were highlighted in the July 2000 'Telecommunications Use, Constraints and Potential in Rural Areas' survey commissioned by the Ministry of Agriculture and Forestry (MAF). Problems ranged from the inability to get calls through to the lack of knowledge displayed by operators in locating callers geographically, which was even resulting in emergency vehicles responding to 111 calls being sent to the wrong address. The survey of 150,000 rural delivery addresses had a 20 percent response rate and of those 99 percent had landlines, 70 percent cellphones, and 61 percent computers. The report said people using the 111 service reported problems ranging from exchange overloading, which prevented calls being connected, through to poor cellphone coverage. More than half of rural phone users reported line problems, disconnection during Internet calls, noisy lines, and exchange overloading. MAF said the problems related to the centralisation of emergency services as well as telecommunications issues. The report said it was difficult to see how the rural sector could be adequately serviced for Internet access without access speeds of 33kbit/sec over the next two–five years.[22]

The primary sector – providing 67 percent of our exports – was attempting to embrace e-commerce and on-line activity, but its biggest challenge, said Communications Minister Paul Swain, was telecommunications. "The suggestion that electric fences are preventing farmers from accessing their email is not a good image of the new economy." He was responding to Telecom's claim that New Zealand's high use of electric fences in the farming community was contributing to poor line quality in rural areas, making it impossible for many locations to access the Internet at anywhere near decent speeds. This was tantamount to blaming the farmers for poor Internet access because they hadn't been weeding under their electric fences.

A special working group of Federated Farmers, fence manufacturers and of course Telecom, began developing guidelines and embarked on an 18-month education campaign. The official brochure, the 'Five-Step Electric Fence Check,' said poorly installed or maintained fences could cause loud clicks on phone lines or greatly reduce the speed and reliability of dial-up Internet connections. Poor layout and tall grass apparently caused fences to earth and arc up the telephone lines. While these preventative measures might improve speed and reliability, it was certainly a poor substitute for replacing or upgrading corroded copper and inefficient insulators. Meanwhile many rural customers continued to experience congestion and line-quality problems, with many unable to get Internet at all.

HEARTLAND INITIATIVES

Fortunately there were more practical, innovative, and forward-looking solutions on the horizon to drag provincial New Zealand from the world of the crank-handle phone into the modern age. Paul Swain's long awaited 'broadband for everyone' vision was finally taking shape, even if he was simply tapping into existing resources and waking up communities to their do-it-yourself heritage. He promised equitable broadband access across the nation by 2003.

TVNZ-owned distribution arm BCL would provide wireless interconnection to all carriers to help bridge the digital divide. Its technology would be upgraded and new broadcast towers added to ensure maximum coverage. Swain said he would tell government agencies to pool their communications budgets in conjunction with local industry to force a better deal from the nation's carriers. The government would invest $300,000 so Northland, Southland, Taranaki, Wairarapa, South Waikato, and East Cape could assess their needs and start bargaining.

New radio frequencies would be auctioned, with up to 20 percent designated for needy areas. Communities able to attract and supply better coverage might even be eligible for Kiwi Share rebates. The solution might be a mix 'n match of copper, fibre, satellite, and wireless, ensuring speeds of at

least 128kbit/sec. It was a 'user pays' affair, but at least it got beyond the 9600kbit/sec involuntary speed limit, likely to remain common until Telecom was forced to upgrade its network within a year of the Telecommunications Bill passing into law.

Not long before Telecom had been talking about exiting 'loss-making' rural areas, but now it had decided to stay in the game. It knew competition was emerging and of course government funding was now available, so it would continue to play the game as though it owned the field. There were options, it said, to boost coverage to 150,000 disadvantaged rural customers – including 66,000 farmers and 10,000 businesses – but not without a commercial return. Copper-enhancing DSL, satellite, its new-generation cellular network and wireless could do the job but Telecom claimed it would cost between five and fourty times more to reach remote customers than city folk. A guarantee of 50 DSL users within 6km of an exchange was the benchmark for an upgrade.[23]

Communities fed up with being ignored by carriers were exercising their collective might. The Otago Community Trust was underwriting upgrades at Telecom exchanges; for every 320 customers signed up Telecom would pay back a portion of the cost. Tuatapere School in Southland couldn't get decent bandwidth to Christchurch so the community built a third tower. And mega-dairy conglomerate Fonterra was talking with telcos and the rural community about poor Internet access with a view to maximising its own resources and possibly offering nationwide bandwidth. John Pask of Federated Farmers welcomed the broadband initiatives with caution: "People have been promising these sorts of things for three or fours years. Until it happens I think people will remain a bit sceptical."

One relief plan backed by Federated Farmers had been at a stalemate for eight months, with Telecom refusing Timaru ISP Bay City Internet access to its rural exchanges. The ISP wanted to trial Ericsson's copper-enhancing Home Internet Solution, enabling data speeds up to 128kbit/sec (soon 512kbit/sec) within 20km of an exchange. In the cities and some suburbs electrical authorities were beginning to diversify and put in their own fibre, while independent carriers such as Wellington's CityLink and the new generation of wireless and satellite players were doing their bit to help close the gap. Saturn Communications had broken Telecom's hold in Wellington with a full service including cable TV, telephone, and fast Internet access. It had made such an impression that Australian carrier Telstra decided to partner with it to extend that network across the country. TelstraSaturn's Chello fast Internet service included line rental and 512kbit/sec Internet for $110 per month. For another $25 you could receive 20 channels of pay TV.

TelstraSaturn and Clear were both partnering with Vodafone for mobile services and forging alliances with wireless providers to extend their coverage, and there was a new level of co-operation between academia, business, and local authorities to establish alternative access in some regions. These were encouraging signs.

THE BROADBAND BACKBLOCKS

At the end of 2001 statistics suggested around 60 percent of New Zealanders now had Internet access, and moving up to broadband for a richer content experience and easier use of complex services was top of mind.

According to a report by Multimedia Research Group, the number of broadband users worldwide was expected to reach around 15 million, doubling to more than 30 million by 2004. However that option remained untried by most New Zealanders. The manager of the Southern Cross cable system linking us to the United States and Australia said while a lot of cable capacity had been purchased, its use remained sluggish. Ross Pfeffer said poor marketing and high pricing from the major carriers had kept broadband 'the world's best-kept secret.'

New Zealand rated only 16th among 30 OECD nations in the 2001 'Development of Broadband Access' report, largely due to lack of competition and high costs. At the start of the year we had only 0.27 broadband subscribers per 100 inhabitants compared with South Korea at 9.2, Canada with 4.54, the United States at 2.25 and Austria at 1.7. The report said governments must promote competition by opening the networks of dominant telcos to competitive forces through LLU or line sharing. New Zealand was singled out as one of four countries that hadn't passed laws requiring this. Telecom still dominated the fast market with its JetStream service running at speeds of between 256kbit/sec and 6Mbit/sec with 400Mb and 600Mb data caps; users paid 20 cents per Mb for any excess data use. A flat-rate JetStart service with a speed limit of 128kbit/sec was also offered. Telecom had signed up around 22,000 DSL subscribers, 39 percent of them residential customers. DSL was now available at 110 exchanges and 30 ISPs were reselling Telecom's service.

Clear Communications was offering its own DSL service in some parts of the country but TelstraSaturn's high-speed cable offering had failed to reach beyond Wellington and Christchurch. Clear had a number of business-based wireless offerings. For domestic users the only other alternatives were Ihug's wireless and satellite accounts and Waverider accounts from Walker Wireless, which was bullishly talking about coverage of 70 percent of the population by 2004. Users were paying $70–$100 per month for a fast Internet service including modem rental and ISP access. Efforts by Paul Swain to have competing providers, including TVNZ-owned BCL, deliver broadband access for all New Zealanders, including 'farmers down lonely roads' by the unlikely deadline of the end of 2003, still awaited a viable business plan.[24]

The great dream of high-speed telecommunications closing the gaps between town and country and the major cities was fading by the day, while the government commissioned endless reports but remained on the sideline. While Paul Swain had suggested bold targets to accelerate the spread of high-speed Internet to outlying areas, Treasury stepped in with the surprising suggestion that New Zealand should abandon rural areas and small towns and focus on making our major cities more competitive with Sydney and New York.

Faster Internet access was pivotal for progressive nations to participate in the next economy of interactive e-commerce and a media-rich Web. While Telecom had promised the government it would upgrade its aging network to ensure 14.4kbit/sec access speeds across the nation within a year, the Australian Government had pledged broadband access for all homes and businesses, and was rapidly moving to implement local loop unbundling. Telstra was promising to upgrade all its lines to enable minimum access speeds of 19.2kbit/sec.

New Zealand was being slammed for the high cost of broadband access and its use of metered rather than unlimited monthly access charges used in most OECD countries. Telecom's flat rate 128kbps JetStart, ranked 29th out of 35 OECD offerings, fell below the 256kbit/sec threshold considered to be broadband.[25] The company's claims that unbundling might discourage investment in new infrastructure were also being questioned.

FADING VISION

Swain's scheme to get us all within reach of broadband by 2003 was admirable, but he was still up against the free market where nothing was for free. Having government agencies pool resources to leverage a better telecommunications deal for themselves and local communities was a great suggestion, but he needed to remember government agencies had been retreating from rural areas and smaller townships for some years. The local dole office, hospitals, post office, and police station were no longer a given in small towns, and the local library probably couldn't afford subscriptions to basic magazines, let alone high-speed Internet. That left schools and the agricultural industry at

the hub of the rural information society. Breaking existing commercial contracts with Telecom and Clear to pool resources would also prove difficult. Perhaps more local authorities should have taken a closer look at section 657 of the Local Government Act, which allowed them to contract for the provision of telephones and telephone lines and pay for it through the general rate.

In 2001 residents at Piha beach on Waitakere City's west coast were justifiably frustrated by a Telecom advertisement filmed in their community, showing a businesswoman teleconferencing from her laptop while her husband painted her toenails under the table. Who were these people? If you lived in Piha you would have known that it was hard enough with exchange overloading to get a second line for a fax let alone access to fast Internet or videoconferencing. Telecom insisted the location for the advert was entirely hypothetical. Ironically the home used for the film shoot was owned by millionaire art patron Jenny Gibbs, whose husband Alan Gibbs had been involved in the privatisation of Telecom.[26]

It was becoming obvious that real competition for the average subscriber could not happen in any substantial way while Telecom remained the wholesaler of services to all other carriers. The deadline for Swain's 'broadband for everyone' initiative continued to slip, with the claim there would be no government money invested or a review of local loop unbundling until at least 2003. Meanwhile Telecom was in full-blown competitive mode, slashing monthly line charges in Wellington and Christchurch, the only places where it was facing serious competition from TelstraSaturn. Telecom began bundling Sky TV with its voice and Internet services. In Christchurch, in particular, competition seemed to be working as prices edged downwards.

So what had happened to the magnanimous billion-dollar announcement at the end of 1999 that TelstraSaturn would cable the country and significantly expand its residential and broadband services? Financially troubled partner Austar didn't have the resources to make much of a contribution so Telstra had slowed its own investment in local infrastructure and was looking for another partner to make good on its promises. Then TelstraSaturn made its move, paying British Telecom $435 million for a majority shareholding in Clear Communications, including $270 million in debt. The company, which was halfway through its $200 million high-speed cable roll-out in Christchurch, immediately froze the project with the loss of 150 jobs.[27] The takeover initially appeared to be good news, with the likely outcome that the acquisition would accelerate plans for a leading-edge competitive network. In the past both companies had come up against the unmovable might of Telecom. Together and rebranded as TelstraClear you might imagine big battle plans, sinister strategies and rapid roll-out were the order of the day.

The Overseas Investment Commission (OIC) wasn't concerned that the two main market competitors were joining forces; in fact it seemed to welcome the decision:

> *Both the Applicant and Clear operate in areas of the telecommunications market with some, but generally limited, overlap. Both companies have planned to expand in their own and into each others market segments. This would require substantial direct investment by both companies. It is deemed to be inefficient for both to continue to duplicate their assets and business structures in the relatively small New Zealand market given the level of market dominance of Telecom. The proposed transaction is likely to produce a competitor in the market with a critical mass which will result in more effective competition and will allow for the planned expansion in a more efficient manner.*

The Commerce Commission investigated the takeover but found nothing to prevent it, simply outlining its assets and ownership structure and stamping its approval.[28] A report from Merrill Lynch Australia, however, warned the takeover would reduce competition, leading to the loss of 500 jobs from the combined company's workforce of approximately 1700 and higher prices for consumers.

It would create a "duopoly fixed network telecomms structure in New Zealand for all but certain CBD areas where other fibre has been laid." Telecom would benefit: "TelstraSaturn and Telecom NZ should experience some benefits from a reduction in general competition levels and pricing pressures across long distance voice, Internet, and mobile services."[29]

Indeed it had been too good to be true. TelstraClear would refocus on the easy money, rationalise investment, prepare for major redundancies, and begin cosying up to its nemesis. It boasted that it expected annual savings of about $100 million in capital expenditure and $50 million in operational savings by combining the businesses, including the sacking of hundreds of staff. That didn't sound like an aggressive competitor about to leverage the expertise of a major acquisition and make good on the $1.7 billion combined investment already made in the local market. The grand plans forged only two years previously for a massive full-service business and residential network to compete against the largely unchallenged might of Telecom had been downgraded to a friendly duopoly.[30]

TelstraClear would renew its focus on core services for the business community and strike wholesale agreements to on-sell Telecom services to bridge the gaps in its two networks. Early in 2002 it tried to reassure the market of its ongoing commitment to a domestic network, but the completion of the Christchurch phase remained on hold. Its Auckland roll-out was a year behind and it was uncertain of the timeframe for other centres. It was doubtful its planned nationwide coverage would be achieved by 2004, or if TelstraClear would ever live up to its promises to provide independent access to the majority of businesses and residences.

Meanwhile Telecom continued to diversify as a formidable trans-Tasman carrier, raising questions about its commitment and investment on its home patch. Despite gross earnings of $537 million for 2001 – $17 million up on 2000 – Telecom was concerned about eroding profits and slashed $200 million of its proposed $1.1 billion capital expenditure for 2002. It was hoping to reap an extra $26 million annually through residential line rental increases (up $1.71–$38.05 a month) although in Wellington and Christchurch where it faced direct competition from TelstraClear there would be a discount. Again Telecom blamed Internet use for its need to raise prices, saying its Kiwi Share obligations left no alternative. It claimed free domestic calls were costing it $180 million a year and it had already spent $119 million in the past three years upgrading the local network.

The New Zealand telecommunications market was worth about $4.1 billion in the 2000–2001 year and expected to grow rapidly to $5–$6 billion by 2005, according to Telstra International president Dick Simpson. Australian telecommunications researcher Paul Budde was even more bullish, predicting market growth to $15 billion within a decade. Investing in high-speed infrastructure to service the main centres, suburbs, towns and provinces was essential for New Zealand's competitiveness, prosperity, and well-being. This required long-term thinking and planning. However greedy boards of directors demanding an instant return on investment were doing themselves, their customers, and the nation a major disservice.

11

Deluge in a paper cup

Knowledge wave wake-up

> The rules and practices that determined success in the industrial economy of the 20th century need rewriting in an interconnected world where resources such as know-how are more critical than other economic resources. These rules need to be rewritten at the levels of firms and industries in terms of knowledge management and at the level of public policy as knowledge policy or knowledge-related policy. An aspect of knowledge that has been largely forgotten in knowledge economy thinking is wisdom. Wisdom invokes questions of judgement, ethics, experience and intuition, all of which are necessary for the best application of knowledge.
> The Knowledge Economy, Wikipedia.

At the dawn of the new millennium you could hear uncertain mutterings around the halls of power; earnest rantings about an emerging 'knowledge economy' were the revelations of a Rip van Winkle waking from a decade of dozing to a world that had passed him by. In his cobwebbed hand was a pile of yellowing reports and studies on how a nation might transform itself for the age of light-speed communication and borderless transactions by being visionary and backing winners.

The techno prophets had foretold that even in the remotest outposts the 'tyranny of distance' would quickly be defeated and New Zealand would be able to participate in a new digital economy on an equal footing with world powers. We could work electronically while those in retro time zones slept. Our tiny nation would become a great repository of knowledge and innovation, a haven for entrepreneurial activity and intellectual property creation, safe from itchy nuclear trigger fingers, and terrorist interests.

We were a nation of 3.8 million, generally well-educated people with a modern infrastructure, an abundance of creativity and a pioneering spirit. We typically had a rare combination of talent, skill, and innovation. We weren't bogged down by unions who insisted it was 'more than our job's worth' to step beyond our work definition. Our creative people were technically aware, and our technical people were typically creative. If the off-the-shelf solution didn't work we would adapt it or make our own. If someone said something couldn't be done, that was seen as a challenge to prove them wrong.

There was a sense that this was New Zealand's time in history, but if we didn't know who we were and what we stood for then the big question was, how would we ever rally the passion to get to where we needed to be? We should have been an incredibly wealthy little nation by the turn of the millennium but it seemed we were sliding down a slippery slope. So what had gone wrong?

For a start we weren't very good at pushing our own barrow; telling the world our well-kept secrets. We just got on with it and hoped the government or industry groups would do that for us. Of course there were the clichés that New Zealanders were afflicted by the 'tall poppy syndrome' – eternally slapped down by those who felt they could do better – or that we were a humble lot of quiet achievers. There was truth in both assertions and as a consequence the tall poppy harvester had reaped a fair crop in its time. We conveniently forgot our best quality meat, dairy produce, seafood, software, and expertise was in high demand offshore.

There were those who misinterpreted visionary thinking as arrogance and rejected any call to national pride as 'uncool,' fuelling the 'Kiwi cringe' myth that if it came from anywhere else it must be better than if it came from here. Unlike the United States where 'pick me' was considered a sign of enthusiasm worth encouraging, downunder in the 'land of the long white shroud' we were becoming adept at shooting our own pioneers in the back. If the 'sit down, shut up and pull your head in' armchair crowd hadn't done enough damage to our fragile egos, then the failure of successive governments to foster, encourage, and market our fledgling digital industries to the world might finish off the job.

GLOBAL WARNINGS

While the statistics told us how many sheep, trees, and cars we had, there was little official recognition or analysis of our vibrant community of smart business people, intelligent and innovative software developers, hi-tech engineers, inventors, scientists, film makers, artists, songwriters and authors, experienced consultants, designers, and entrepreneurs. We were full of ideas but often lacked the funding, marketing, or business skills to turn them into profitable ventures. When *Wired* magazine publisher Kevin Kelly visited New Zealand in 1988, he suggested our high levels of creativity were due to being a nation literally on the edge. While the centre typically represented stability and comfort, 'the edge' was usually an exhilarating, active place where change and innovation occurred.

People had been talking about establishing New Zealand as a global repository for information since the 1970s, but no one except the computer press and industry groups seemed to catch on. In 1992 the government set up the WCL to explore the hi-tech possibilities of the future and ensure the newly deregulated New Zealand economy remained at the leading edge. Its main focus was on developing bandwidth and high-speed applications that might benefit the country through foreign investment and by attracting research and development facilities to our 'wired' environment. The government and Telecom withdrew funding for the WCL after only two years.

Faster communications from the heartland of business through to the average consumer was essential if New Zealanders were going to seriously participate in the world of on-demand services, electronic commerce, and interactive multimedia. The Internet was fundamentally changing relationships of all kinds, bringing synergies between individuals, groups, and nations. But as usual policy lagged practice. The World Development Report (1999) stated it clearly for all to see; 'today's most advanced economies were focusing on knowledge as the most important factor in determining the standard of living.' No one could say we hadn't been warned to shift from the 1950s farming, forestry, and fishing mainstay to embrace the next economy, one based on zeroes and ones and intellectual property.

New Zealand continued to ignore expensive advice to reshape, re-educate and restructure for the new world. Endless government reports on e-commerce and the knowledge wave, including the

need to revise our Crimes Act and Copyright Act to enforce and protect our intellectual property and our compliance with international treaties, were still languishing. Each report and study, showing clearly where we needed to be in the future to remain competitive, seemed to get little further than the in-trays of ministers or bureaucrats. We continued to steadily slip down the OECD top 30.

The warning that we were ill prepared had been sounded numerous times, including by Harvard professor Michael Porter in 1991[1] and again in 1998 when he came to review our lack of progress in migrating to an information-based society. *Upgrading New Zealand's Competitive Advantage*, co-authored by Porter, was commissioned by the government in the late 1980s after a two-year study. It looked at four companies operating in each of 16 market sectors, and suggested strategies for future growth. It was considered inspirational at the time but nothing was implemented at government level and there was no follow-up. The Porter Project, as it came to be known, claimed our economy had fallen out of alignment with the mandates of modern competition, with little having changed since the 1950s. It warned that unless New Zealand encouraged growth in more hi-tech industries we would remain out of step with the global economy.

Tony Caughey, principal with strategic consultancy firm Caughey O'Boyle, was involved in the original Porter Project and said much of Porter's research ended up in ministerial speeches and his philosophy and ideas were picked up by senior management across the country. "The awareness of his ideas was high. It had an impact on a lot of people but it was never institutionalised and nothing was set up to press ahead."[2] Porter returned in 1998 as a guest of Trade New Zealand and the Department of Commerce to review what had happened in the interim and float new ideas about how the country might improve its performance.

ENERGISING VISION

At the Future Active gathering, run by the New Zealand Software Association in conjunction with North Shore City in November 1998, Porter explained that New Zealand needed to find and celebrate an energising national vision that captured our distinctive culture, circumstances, and history. The country had gone through the painful process of privatising, reducing subsidies, and opening up our markets to the world but had focused on the negative aspects of those changes. Now it needed to look at the positive side, encouraging innovation and differentiating businesses for economic growth. The business strategist addressed about 500 hi-tech industry representatives and met with Prime Minister Jenny Shipley and key cabinet ministers and industry leaders in Wellington.

He said, only half of his proposals were acted on, including privatisation, reduced subsidies and opening up markets. "You did not invest heavily in resources, revitalise science and technology or focus on the positive parts." New Zealand took the ideology of the free market to the extreme and this had held us back. Structural reforms had been made out fear and concern for survival, although this had motivated companies to make difficult changes and many improvements. "What is needed now is to create an excitement and an energising view of what New Zealand could be." The focus so far had been on what New Zealand wouldn't do. "You won't protect markets, intervene, distort markets through subsidies or have government mucking around. However there has been a lack of what New Zealand will do."

New Zealand needed to be on the map in software and other industries but this would not happen by osmosis; only when people worked together and did things as a group. Industry associations had an important role to play; beyond simply being 'bitch 'n moan' trade associations they could facilitate clusters. There was a need to expand boundaries. More industry groups needed to get together and seek common goals. "I would like to see a group formed which includes members of the government and opposition, labour and management and various parts of society to go through

a process of becoming informed about economic reality and create a more enduring bi-partisan approach to moving the economy forward."

While achieving best practice was a basic requirement in business, much more was needed, including strategy. "You cannot get away with trying to run the same race faster. You have to be in a different race, find a unique position for your businesses and excel at it." New Zealand still had some way to go in achieving this, and its existing ideology had made it timid. While we had mostly got it right from a macroeconomic level we hadn't created the right microeconomic environment to allow innovation to flourish, said Porter. Companies had done a lot to tighten up, improve organisational efficiency and move towards exporting but there was not yet enough distinctive differentiation. Many companies were still competing in ways that are very similar to other countries. "You have to innovate not imitate and there's a disturbing rate of innovation in New Zealand." He produced world patent statistics showing New Zealand in 1996 had only 15 global patents which compared poorly to Japan (184), the United States (120) and Switzerland (160).[3]

Porter's economic advice came two weeks after Trade New Zealand chief executive Fran Wilde had warned that hi-tech industry groups needed to work more closely together to build export success and sustain future growth. If they didn't rise to that challenge, New Zealand risked becoming a banana republic.

Wilde was on a panel of seven industry experts at the Hi-tech Forum, where the software and electronics industries first got together to consider a common path into the future. She pointed to our gross domestic product (GDP), which had continued to plummet over the past decade; evidence New Zealand was still struggling to find its way in the world. Our biggest export sector remained dairying but the majority of growth recently had been in high value-added manufacturing including electronics, services and software. "We have to move our employment structure to reflect the change from the industrial and agricultural age into the age of services." We must be seen as a global producer and supplier of high-quality niche products and services with high exports per capita. The combined might of software, electronics, telecommunications, and other intellectual property-based industries could pull us back from the brink after a decade of declining GDP earnings, she said.

The hi-tech sector needed to be harnessed for future growth and it should not be left to politicians to make things happen. "If we don't take our future into our hands our kids will blame us and so will our grandchildren." Our declining GDP and overall export performance was a major warning for New Zealand. We were beneath the trend in world trade growth against countries we often liked to compare ourselves with; our exports as a percentage of GDP were well below Ireland, Denmark, Austria, and Finland.

One attempt at quantifying the value of the combined hi-tech industry suggested it was likely to be significantly more than $5.6 billion. Investment bankers Morel & Co, in a technology review commissioned by the government, said our successes in the sector were a well-kept secret. For example hi-tech hardware exports went from $141 million to $377 million between 1991 and 1996. New Zealand's total hardware, software, and biotechnology exports were estimated at $738 million for 1997, up from $512 million in 1996. Survey group IRL claimed the electronics export industry was worth $880 million in 1997, with exports valued at $620 million.

SCIENCE SENSE SLIPPING

The newly formed NZ Inc (Intellectual Capital) foundation was eager to promote a better export environment and get the news of our competence in this area out to the rest of the world. NZ Inc director John Blackham said current regulation and financial legislation was aimed at bricks

and mortar. "All of this disappears in the information age. Everything from basic accounting principles to securities legislation will need to be changed. The business environment needs to stimulate entrepreneurs and knowledge workers in New Zealand." However educating the right people about the challenges ahead seemed daunting. A Ministry of Research, Science and Technology (MoRST) survey showed fewer than 10 percent of New Zealanders understood what science and technology was about, and more than 50 percent believed the risks of new technology outweighed the benefits. "It's a shocking platform to build a competitive economy in the knowledge age," said chief executive James Buwalda.

ICT activist, John Blackham.

He revealed 23 percent of our graduates were in science and technology, down from 36 percent in 1988, while the output from countries with similar economies was 40–50 percent. Dr Buwalda said New Zealand had an urgent challenge to shape lives, environments, and enterprises for the knowledge revolution. "We've been overlooking major drivers of wealth, productivity and economic growth. 'New growth economics' placed the importance of knowledge at the centre, as a resource that doesn't get used up but grows. Knowledge begets more knowledge – the law of diminishing returns is really just a lack of imagination." Research over the past 40–50 years in the United States had shown 87 percent of all economic growth could be put down to new knowledge and technological change not economic efficiency and capital investment.

Institute of Professional Engineers (IPENZ) chief executive Warwick Bishop said engineers had to take much more responsibility for educating and improving their own skills to ensure career development. However up to 20 percent of students left the country after graduation, leaving a falling population of expertise. Better education was the key to the success of knowledge-based industries. "Youngsters five to 11 years old are much more technologically aware but there's a fall-off in maths and sciences beyond age 16-17." An Australian study showed the best job prospects were engineering with health and medicine, followed by agriculture and marketing, information technology, and telecommunications as career choices.[4]

Finally the government and opposition appeared to have had a revelation. The mutterings turned to talk about a bright future where people would be equipped with the right skills, where small, smart businesses would be kick-started. In that future we would attract investment and put more into education, science, and technology. There was even talk of culture, creativity and – horror of horrors – a whisper of tax breaks. What a turnaround.

The awakening highlighted the inaction of successive governments who had failed to future-proof longer than a three-year election cycle. Beyond free-market reforms they had sat on their hands rather than mucking in to help reshape the nation for the challenges ahead. They watched former SOE Telecom dominate the market and essentially hold the country to ransom. We had the latest digital network, one of the highest take-ups of Internet and cellphone use, we had transformed our key businesses into mean, market-driven machines and produced world-class hi-tech products.

Without strong competition in telecommunications, however, prices stayed up and fewer benefits flowed to business and home users. A few thousand subscribers had been given a taste of what was to come with fast Internet with Telecom's JetStream copper enhancement technology,

TelstraSaturn's full-service cable system in Wellington and Ihug's satellite service, but the real benefits of healthy competition such as e-commerce and all the other wonders of the Web were still trickling down to most New Zealanders at the dawn of the new millennium.

We wanted to get to the world and the world was curious about us, but most satellites were either booked up or pointing the other way and competition on the tilted playing field had slowed investment in alternative local and international communications links. The full benefits of deregulation were slow to flow on to data services, even though the business community had been crying out for affordable capacity for years. web sites with streaming video and audio, up-to-date news and e-commerce capabilities could showcase New Zealand to the world, but that required big pipes so Web content could deliver in real time not daylight saving time.[5]

BADLY BRANDED AND STRANDED

It wasn't as if New Zealand hadn't had ample opportunity to profile itself to the world; it had just neglected to do so in any cohesive way. The obvious window was the conjunction of the America's Cup, the Rugby World Cup, and the APEC meeting in Auckland in the final months of 1999. Then of course there was that most unique of openings where New Zealand would be the first land to see the rising of the sun on the new millennium.

In fact New Zealand was riding the crest of an international publicity wave, starring in *Time* magazine, featuring in newspaper headlines around the world and on major American TV channels. The 'massive exposure' was labelled priceless by the Tourism Board, which predicted million-dollar spin-offs for the local economy.[6] It all sounded too good to be true, but where was the follow-through, the big marketing campaign to capitalise on all this free publicity, the invitations to bring top business people to New Zealand to look at investment opportunities, the openings generated by our offshore ambassadors to show our wares to the world? When the dust settled there was, well, dust, and maybe a few extra tourists visiting our best-known attractions.

The same fervour had been apparent back in 1991 when some bureaucrat decided New Zealand was going to have 'the world's most powerful national brand' and an annual budget of $2.8 million was set aside for it. The exercise by the Tourism Board and Trade New Zealand took eight years. Agents went around the world securing the exclusive rights to use a colour version of the logo; a white fern on a blue and green background, which cost around $750,000. However this was determined by the board, now known as Tradenz and the department now known as the Tourism Board, as too frivolous for export use. A revised logo was to have been part of 'the New Zealand Way' promotion from 1993 but failed to grab the support needed to be considered a national exercise. Then in January 2000, after repeating the global permission process and an overall investment of around $12 million, the logo was finally presented to the public. The outcome – wait for it – a black-and-white silver fern.[7]

KIWIS IN CULTURAL CRISIS

At the turn of the century New Zealand was at the cultural crossroads. We could use our unique Pacific identity and new electronic tools to tell the world we had something special or become a cultural outpost forever. Obvious openings existed for software developers, artists, songwriters, musicians, publishers, animators, movie makers, and writers to take control of their own destiny and stake a claim on the new wild western

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electronic frontier. However only those with tough skins needed to apply.

Creative Kiwis were being encouraged to learn the tools of the digital age, rediscover the pioneering spirit, and join the do-it-yourself cultural revolution. That was all that was left to do, it seemed, for a nation of innovators and artistically gifted people who were being systematically sidelined rather than recognised as part of a global growth industry in intellectual property.

Media reports were painting a picture of Kiwis in cultural crisis. We were told each generation was more depressed, losing our sense of individuality, and becoming 'culturally insecure.' We were importing our cultural values. Susan Pointon, a media studies tutor at Auckland University, said there was a direct correlation between dignity and national pride and the degree to which governments were committed to preserving, expanding, and expressing cultural life.

Our level of local content on radio (around 3 percent) and television was among the lowest in the world. We had 21 percent local content on free-to-air TV but 25 percent was repeats. When news, sport, and repeats were taken out that left only 8 percent. By comparison the United States had 95 percent local content, Britain more than 80 percent and Australia 55 percent.

Creative New Zealand received $4.4 million a year in grants from the government. The balance of $20.2 million in 1997 was from the Lottery Grants Board. Creative NZ, the Film Commission, NZ On Air, and TVNZ all blamed lack of funds for their poor performance in supporting local artists and content.

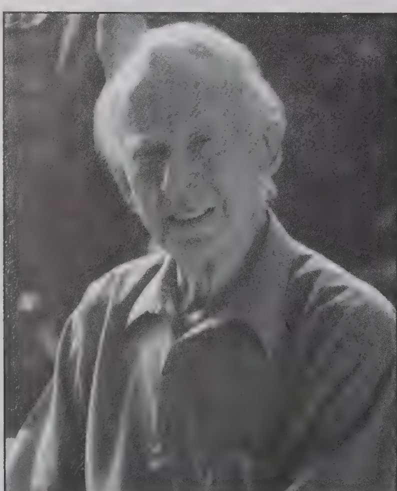
Banks echoed the government in showing no confidence in intellectual capital as an asset, yet the digital future depended on talented teams and great ideas. When a company crashed in Silicon Valley it was considered a battle scar; here the bankrupt were viewed as criminals. We were discouraging entrepreneurs. And the great Kiwi knocking machine was alive and well. Lena Days applied several times to Creative NZ to fund an on-line arts directory only to be old 'we don't do directories.' She discovered, however, they were photocopying her music directory to answer industry queries. She got a grant in 1997, then in a separate incident in 1998, a contract was let to a former Creative NZ employee who promptly copied her material and put it on-line for 56 days until Days discovered it. It was dropped and reparations made.

The intrepid Kiwi entrepreneurial spirit wasn't going to be downgraded to passive mode again. The tools were available and the digital underground was looking at every way possible to go mainstream. PCs and professional software packages for graphics, desktop publishing, digital photography, video editing, and sound recording were cheaper and easier to use than ever. Web development software could quickly turn the Internet into a formidable new platform. The Internet was the perfect forum to create a virtual community of like minds through email, newsgroups, and web sites. The more Web designers, technical people, artists, writers, and musicians swapped notes, the greater the cultural momentum. The number of local sites with arts resources already made any state effort look pallid.
Adapted from an August 1998 Metro *column by Keith Newman.*[8]

Along with dismay at the pitiful results of trying to brand its existing export economy, there was also deep frustration at efforts to define and market sunrise industries. The long push to create a marketable hi-tech brand, encompassing software, computing, IT, telecommunications, electronics, and engineering, had failed to ignite leadership. Little effort was being made to quantify, define, or globally market our fastest-growing sectors. An arrogant bureaucratic attitude within government, and sectarian thinking across the rapidly converging hi-tech industries was obscuring our chances of presenting a united front to the world.

IT entrepreneur Trevor Eagle,[9] managing director of the Eagle Technology Group and head of the Hi-Tech council, was concerned that government statistics weren't giving an accurate picture of hi-tech industries or the amount of research and development going on here because there was little incentive to fill in the required forms. He claimed many companies weren't reporting their expenditure in R&D and IT exports because they were penalised if they did. "If it's reported it has to be amortised over three years to recover the money so they're just writing it off." The only way to get accurate data, he suggested, was to provide an incentive to report sales and to have a single form. "We fill in enough goddamn forms as it is for compliance reasons which are simply get-out-of-jail-free cards for reporting your exports. If you fill the form in you don't get penalised."

A number of user and industry groups were keen to show a united front to government, but there was still resistance from those who wanted to retain their own identity. "No one's showing the way, no one's leading the charge to get to those who have the purse strings to release funding so we can get it spent where it's needed." Eagle said the government was throwing so much money around that there needed to be a single voice to help direct that. "Why aren't we channeling it into areas where we need more skilled people, like information technology and training more scientists and engineers? You'd have thought the Internet and e-commerce would have woken New Zealand up to the importance of the technology sector but there's still tunnel vision." A law was passed to stop technological colleges becoming universities after the Auckland Institute of Technology became the Auckland University of Technology. A bill had been put through parliament limiting the country to eight universities. "It's a nonsense call. Cutting down the number of universities doesn't achieve anything. We've got to lift our sights if we're going to label ourselves a knowledge economy."[10]



Pioneering electronics industry Sir Angus Tait. Photo: e.nz magazine.

Angus Tait,[11] the 80-year-old patron saint of the New Zealand electronics industry, used the occasion of his knighthood in June 1999 to again call for a radical change in the government's attitude and philosophy to ensure a healthy technology-based industry. "Whoever is going to be in power over the next five to ten years has to sort out how they're going to drag the country out of the number 26 position in the OECD race back up to where it used to be 20 years ago. A primary and agricultural-based industry is not going to do that." Sir Angus, knighted for service to technology, manufacturing and export, founded Christchurch-based Tait Electronics, New Zealand's largest exporter of telecommunications equipment, in the late 1970s. The company was the lynchpin on which Christchurch built its reputation as the electronics capital of the country. Tait said many countries of comparable size and resource had built substantial technology-based industries which contributed a

sizeable chunk to their economies. "I don't think that's believed at the Beehive," said Tait, who had been campaigning for changes in New Zealand's attitude towards technology for 20 years.

A combination of our pioneering history and the ability to survive the market being turned upside down in the early 1980s meant the jewel in New Zealand's crown was its ability to do more with less. "While we have a very cost-effective economy, Ireland, Finland, and Singapore haven't had governments sitting on their hands on the sideline; they've had their hands in up to the elbows making things happen." He blamed our economic woes on the post-1984 philosophy which suggested the market alone would solve all our problems and that government should neither help nor hinder. "In the lunatic years of the 1980s no one listened because so many clever young men in glass towers, moving pieces of paper around, had everyone's attention. It is important, however, not to lose sight of the fact that no true wealth is ever created until somebody makes something physical. That's what creates careers and jobs," said Tait. One way to begin resolving the country's dilemma, he suggested, was to make it more affordable to train engineers than it is to train lawyers and accountants. "But there's no use generating engineers unless there are opportunities for them. There's got to be a broad re-think across the spectrum."[12]

ALL HANDS BACK ON BOARD

The Labour-Alliance Government made some serious attempts at getting rid of the hands-off philosophy of the previous government. Its focus on removing the roadblocks to the knowledge economy kicked off with the e-Commerce Summit in November 2000 and continued with a series of roadshows, encouraging the private sector to get involved. The summit made it appear the government was leading the way into a new era. But the technically literate sea of suits at the Aotea Centre may as well have been at an Amway conference. While echoing industry concerns and attempting to make peace with the business community, much of what the government was saying simply picked up the old pieces and threw them up in the air again. We'd heard the platitudes often enough: venture capital must be encouraged, changes must be made within education to produce appropriate talent for the times, and immigration policy needed overhauling so essential skills could be imported as required. Our politicians, mostly still struggling to come to terms with email, were preaching to the converted.

Following many years of volunteer advocacy work undertaken by Trevor Eagle, business entrepreneur Sir Gil Simpson became our de facto hi-tech cheerleader, seconded by the government to champion the knowledge economy. As head of industry-led e-Commerce Action Team (eCAT), he believed technological prosperity could come only through a renewed sense of the pioneering spirit with business developing its own vision. Government must simply remove any impediments.

We applauded when IT and communications figures showed 7 percent growth to $11 billion for

Sir Gil Simpson, programmer, creator of the LINC language, founder of JADE Corporation, CEO of Aoraki Corporation, former chairman of the government's e-Commerce Action Team. He was knighted in 2000 for his services to the computer industry and inducted into the New Zealand Business Hall of Fame in 2005.

2000, but forgot we still had the lowest proportion of hi-tech exports of any developed country. About 30 companies earned half our foreign exchange with only one in 25 exporting; 95 percent were exporting less than $5 million a year. Instead of attracting business investment it seemed we were in the midst of a fire sale. Mergers and acquisitions to offshore interests topped $12 billion for 2000 and the trend continued in 2001. Government asset sales were supposed to pay the bills but as Deputy Prime Minister Jim Anderton kept pointing out, we hadn't paid our way in the world for 27 consecutive years. Living standards had fallen dramatically and we owed $105 billion ($27,000 per person) because we had been living in the past.

We had failed to regard industry barons and wealth creators as heroes, despising their fortunes and conveniently forgetting their investment in productive job-creating industries. Craig Heatley, founder of Sky TV, and one of the country's richest men, warned on his exit from these shores that we lacked a national plan for success in the world. We needed to develop innovation and leadership, offer better tax rates to attract foreign investment, and forge stronger links between the public and private sectors. Professor Howard Frederick, head of Unitec's centre for innovation and entrepreneurship, said we were very good at creating truly novel things, but our entrepreneurial skills needed advancing so our inventions could actually reach the marketplace.

The fact was that Kiwis were well respected around the world and their skills and attitude were in high demand. At international law firms, investment banks, or hi-tech companies there was often a Kiwi somewhere near the top. Nick Bain, former head of NZInc, who had joined the Office of the Prime Minister and Cabinet, had been told by a Silicon Valley executive, "If you had Indians involved in your organisation at board level 15 years ago it was a sign you were going to be successful. Now having a Kiwi high up in your organisation has become a measure of market success." Why? Because of our entrepreneurial overview across multiple disciplines, our good work ethic, skills, and training and our ability to quickly pick up what's happening globally, give it a contemporary spin and make it our own.[13]

However at home we were not turning out enough engineering and computer science graduates and the amount spent on research and development was abysmal. In its Human Development Report, the United Nations rated us in the top 12 countries for patents granted but pointed out technology comprised only 15.4 percent of our total exports, on par with Chile, Trinidad, and Columbia. In February 2001 a survey of 103 scientists revealed 58 percent would not recommend young people take up a career in science. The pay was poor, the funding scarce, and the career path unattractive. Meanwhile the number of young people even vaguely interested in a career in science and engineering continued to decline.[14]

Our Internet uptake was at critical mass, but most businesses were struggling to find the incentive to move beyond email and a home page. We were losing our reputation as innovators and early adopters. In its second survey into the attitudes of New Zealand organisations towards e-business, Deloitte Touche Tohmatsu revealed fewer than half our companies had an e-business strategy and fewer than one in five could receive payment on line. It said 28 percent planned no spending on e-initiatives over the next 12 months compared to 6 percent in 2000. The University of Waikato Management School raised similar concerns. Only half those surveyed had web sites and one in five were capable of secure transactions. The lack of e-business readiness by partners, customers, and suppliers was perceived as a major difficulty.[15]

While there was every indication government, industry, and business were beginning to rally, the warnings we ignored were now coming back to haunt us. A May 2001 report from the *Economist* magazine's Economic Intelligence Unit (EIU) upset the government by ranking us 20th among the world's 60 largest economies, claiming our e-readiness was stunted by an ill-prepared legal and regulatory environment. The United States was top with Australia second and Britain third. The Australians leveraged the data to make government IT policies a priority.

OVERHAULING E-LEGISLATION

Ironically we were being scored badly on all counts just as the first wave of government and industry partnerships, designed to bring some focus to the issues, reached its crescendo. To ease the way for e-commerce the government was pushing through a raft of legislation that had languished for many years. We were now working on better consumer protection for on-line purchasing, legislation to take a harder line on hacking, which would become a crime, and bringing the legal status of electronic transactions in line with hard copy. Efforts were also underway to provide greater consumer, intellectual property, and privacy protection.

ECAT was talking up e-business as the key to future economic prosperity and advising the government on how the nation's e-commerce plans could be streamlined. There was a new focus on regional development and a mandate in the new Telecommunications Bill to ensure carriers would no longer hold us to ransom. The government promised to become a model user of e-commerce, warning that any company wanting a slice of public sector business must become e-commerce capable. Proposals and suggestions on how to get the nation up and running with the e-commerce vision were posted on the Ministry of Economic Development (MED) e-commerce web site.

And there was fire in the blood of group of change agents and hi-tech industry groups determined to equip the country for the huge challenges ahead. Some of the ideas were revolutionary, some were simply common sense. All would benefit hugely from the wise use of Internet technology. New Zealand Edge web site co-founder and editor Brian Sweeney insisted the country needed a new flag, a good slogan everyone could relate to, new myths, and an optimistic spirit. He suggested we had a major task ahead to improve our image internally and externally. A good start, he said, would be to get rid of the anachronistic Union Jack and replace it with the most recognisable of all symbols, the silver fern. Sweeney was director of corporate communication company Sweeney Vesty, and a partner in developing the nzedge.com site with worldwide head of Saatchi and Saatchi and passionate provocateur of all things Kiwi, Kevin Roberts. His aim was to draw attention to 'world-beating Kiwi ingenuity' and his mantra was: the country needed transformational, creative responses to fast moving ambiguous times, to become more global in its ambitions and grow businesses of scale by reaching through the Internet.

Entrepreneur Brian Sweeney, co-founder of the New Zealand Edge web site. Photo: Robinson, NZ Edge Archive.

The goal of the web site was to empower and liberate the New Zealand spirit; and search for 'Kiwi DNA, and a sense of our own relevance in the world.' "We're here to tell stories, celebrate heroes, share ideas and network the Diaspora – the million or so scattered New Zealanders around the world." Sweeney said good ideas act virally; all it takes is 5 percent of the population to stimulate a major social change. 'Inspiration is infectious.'

New Zealand was the last significant land mass to be settled and the most distant from any other land mass on earth. It has been variously described as a paradise, a sanctuary, an asylum, and a laboratory and its people moody, broody, dislocated, dysfunctional, and introspective. However this had generated an extraordinary sense of innovation and social progress

including in engineering, art, and design. While New Zealand has been at the edge, Sweeney warned it was rapidly losing its place in the world. Australia saw itself as the lucky country – a myth that had served it well. The 'great American dream' had enormous power, suggesting you could come from anywhere and achieve anything in the United States. However New Zealand's 'She'll be right, mate' hadn't done us a lot of good. Neither did the belligerent, Muldoon-inspired 'New Zealand the way you want it,' which was 'an uninspiring, authoritarian piece of politicking.' The Rogernomics free market approach in the '80s saw the country so busy with structural reforms that branding got left behind. "We've had so much left brain functional reform we now need to focus on emotional reform," said Sweeney.

Nuclear Free New Zealand was a great vision, and in some ways the greatest marketing campaign in New Zealand history, portraying us as independent, entrepreneurial risk takers. Closing the gaps was also a good sound bite and while '100 % Pure' was a useful external vision it was totally wrong. "There's a dissonance about what we are projecting internationally and how most New Zealanders feel about themselves. They do not feel 100 percent pure."[16]

Early promotional material for the Catching the Knowledge Wave project, to be run by the government and Auckland University in August 2001, was full of rhetoric and left many who had heard it all before wondering how real-world outcomes could be achieved. Lack of action to back up all the revolutionary ideas had given way to scepticism. We were about to be told once again told we needed to catch the 'knowledge wave' as 30 speakers from around the world tried to inspire 450 representatives from industry, commerce, academia, and government. Dr Chris Tremewan, Auckland University vice chancellor and chairman of the Knowledge Wave project team, said after 40 years of economic under-performance, New Zealand could no longer afford to ignore the implications of this new era of knowledge-driven growth. We need a new, strategic approach to regain our prosperity and competitiveness, he said. Looking through the list of speakers there was a sense of déjà vu, with Harvard Business School professor Dr Michael Porter returning like a prophet of old to point his bony finger at those who had not heeded his warnings. He'd only been here three years previously to tell us we'd done the difficult things but beaten ourselves up in the process.[17]

PORTER'S PRESCRIPTION REFILL

Dr Porter advised New Zealand had taken the free market to the extreme instead of stimulating our thinking, retraining the workforce, investing in science and technology, encouraging innovation, and capitalising on our uniqueness. There had been some movement towards his suggestion that we embrace clustering and technology incubators where like-minded people work together and benefit from each other's contributions. New Zealand's venture capital industry had also begun to come into its own and even the government was considering backing its own investment vehicle. To the surprise of the entire industry, Science Minister Pete Hodgson promised to ask the government for 'tens of millions of dollars' for a venture capital fund to back great Kiwi innovations, in tandem with private sector funding.

However the other key factor in the submissions of Porter and many others continued to be rejected, such as a plea for tax write-offs and incentives to invest in research and development so international firms were more likely to locate here. The banking fraternity also remained unconvinced there was any security in intellectual property, propagating the myth that only bricks and mortar had any lasting value.[18] The ultimate anti-climax at the conclusion of the Knowledge Wave event in August 2001 came when Prime Minister Helen Clark, after listening politely, made the whole exercise seem pointless by stating in a final press conference that the event would not change any of her policies.[19]

Evidence was mounting that government policies and industry efforts weren't going deep enough to encourage the kinds of breakthroughs needed to surf the knowledge wave. Deputy Prime Minister Jim Anderton boasted the results of a public opinion poll in 2001, asking what New Zealanders wanted to be most known for internationally in ten years' time. It revealed 2 percent wanted to have the best sport teams, one in five said 'a clean environment,' and nearly a third wanted 'a fair and tolerant society.' Half of all respondents selected 'a society which thrives on knowledge, creativity and enterprise.'

It was ironic then that universities were complaining that million-dollar cuts were depleting the country's knowledge banks and their libraries were hugely reducing journal subscriptions. Sue Pharo, chairwoman of the Council of New Zealand University Librarians, said the amount of information held in the country was dwindling. "A huge amount of knowledge is no longer available and we will never be able to replace it. The libraries were importing more than 98 percent of their books, journals and databases to keep up with international research. They provided specialist journals for research that were used by academic scientists, public libraries and Crown Institutes." She said, all eight universities had made cuts over the previous three years. Canterbury University alone had cancelled about 1000 journals in 2001, slashing about $1 million off its budget which capped off a gradual decline. Other universities reported similar cuts.[20]

In November 2001 we were again being told that New Zealand was one of the most innovative nations. The Global Entrepreneurship Monitor (GEM) 2001 report rated us the second most entrepreneurial nation (18.2 percent of us) in the world. In the 'opportunity entrepreneurs' category we were number one (82 percent); when it came to acting on a hot business opportunity, the world average was 55 percent. We also had the world's highest rate of female entrepreneurs (44 percent). The study showed 6.2 percent of Kiwis had made some informal investment to help businesses get off the ground compared with the world average of 2.9 percent. Generally though, the level of official venture capital was low. Ironically our entrepreneurs were inwardly focused with low aspirations and only a small percentage were considered dynamic and export oriented. The GEM report recommended entrepreneurship teaching, that research and education be strengthened at all levels and greater effort made to encourage women and Maori.

BROADENING THE BASE

Michelle Caminos, IT services consultant with Gartner Group New Zealand, believed there needed to be 'a better marriage' between the government, the corporate sector, and universities. New Zealand was like a breeding ground for many small start-up companies but better connectivity and a better flow of information was needed and every effort had to be made to avoid death by committee. "With so many people driving their own personal agenda the government can get bombarded by different committees rather than the total industry view. What's lacking is the total vision of how they can work together towards a goal and put steps in place to make that happen." She warned committees can take ages to achieve their goals and by the time they're ready to move the whole environment has changed. Things needed to move faster with true leadership.

Local authorities could set the tone by backing innovative business and helping close the digital divide. Mike Harte, MIS manager at Dunedin City Council, believed more direction should come from central government but local authorities had a huge responsibility to stand in the gap. "Central government isn't community focused and more and more of its services are disappearing, leaving local government to fill the gap." For example, Dunedin City Council had established an economic development unit focused on clustering biotechnology, film, and technology firms and promoting the success stories outside of the city. Within its own 'Silicon Alley' there was Animation Research, which produced the America's Cup graphics, Taylormade, which produced the *Squirt TV* programme and

web sites, Vidmark, responsible for the Wendy Pye CD-Roms, publicly floated e-Media and 'some great stuff' coming out of Otago University. In fact local authorities were already repositories of knowledge for the whole community. "We're like a factory; we manufacture information – we are the custodians of knowledge for ratepayers, customers or citizens."

However Harte warned that 80 percent of the jobs people would be doing by 2011, hadn't been invented in 2001. "There's a whole generation of kids out there now who've never known life without the Internet. So how do you think they'll want to do business with you in 10-15 years time when they're your customers, residents and ratepayers?"[21]

While there was more information available than at any time in the history of the world, much of it in electronic format, turning data into knowledge required specific skills and disciplines. Information might reside on machines but the most valuable knowledge was not in databases, data warehouses or document management systems but in the minds of skilled people and could only be managed if that knowledge was shared. The challenge was for organisations to review their knowledge, organisational goals and the skills and abilities of their people in order to determine if they had what it took to move forward in the new economy.

In other words knowledge management was primarily about the development of people. Dr Dale Bent, director of Victoria University's Master of Information Management course, said while certain tools may be helpful to the process of knowledge development, the best approach for capturing knowledge was to create occasions, usually based on 'communities of practice,' where skilled knowledge workers could describe and pass on their expertise to co-workers. And while business was certainly the main engine, the government must aggressively create a favourable legal and regulatory environment so knowledge enterprises could prosper here. "The key responsibility of knowledge management leaders is creating the organisational trust so that people willingly share their knowledge."

In the knowledge economy someone with a good business sense or creative flair may be more valuable to an organisation than someone who is technically trained. People are a company's greatest asset and the key to future growth. If you retrench skilled people who know your systems and processes for short-term savings, they may end up working for the opposition. It's a bit like shooting yourself in the foot in order to slow down: you'll never walk the same again.

WE'RE LOSING OUR MIND

Remove the heart of the flax,
From where shall the bellbird sing;
you ask me, what is
the most important thing in the world,
I say to you, it is people,
it is people, it is people,
Maori proverb

It seemed New Zealand, with its vast forests and paddocks of wheat and corn, was ignoring the crop most important for the knowledge economy: fertile minds. We hadn't trained enough people with the right skills and we couldn't keep many of the bright minds that did blossom here. That presented a big problem, particularly in the hi-tech industries, where it was becoming almost impossible to replace departing talent.

The trend had begun in 1999, and while it was easy to play the numbers game in succeeding years to suggest the inflow was balancing the outflow, the fact was the majority of those coming to New Zealand didn't meet the specific skill requirements of the nation, and our ability to retain those who did qualify was in doubt.

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Economist Gareth Morgan warned in mid-1999 that the outflow of well-educated people in their 30s with young families heading for better prospects abroad was the most potent way to gut the growth potential of an economy, leaving us as the final resting place for a generation of retired. Our skill base of information technology specialists, lawyers, accountants, financiers, and scientists was being depleted. The major drawcard was a bigger pay packet and with our income per person being 20th out of 27 among the OECD countries we simply couldn't compete.

In the year to March 1999 we experienced our first loss of migrants in nine years and that was the start of a long trend. According to Statistics New Zealand we had 56,580 long-term arrivals but 66,780 departures, leaving us short of 10,200 people. Meanwhile Australia and the United States were welcoming skilled immigrants with open arms, reducing bureaucracy, and even offering incentives because hi-tech companies were demanding their skills. Sydney-based IDC analyst Peter Hind said one of the biggest issues facing New Zealand was high staff turnover and an inability to recruit and retain skilled information technology staff. A survey of 650 Australian and New Zealand information systems managers showed an attrition rate of 31.2 percent compared to only 12.8 percent in 1995. Nearly 40 percent of local firms admitted they weren't exploiting opportunities on the Internet because they didn't have the in-house skills.

And another problem was looming: the education system and the hi-tech industries hadn't done a very good job of predicting future needs and encouraging potential candidates into training. Roger Lampen, managing director of recruiting company The Lampen Group, explained that students didn't seem interested in IT careers. Of 9000 sixth formers surveyed, 60 percent selected hospitality, entertainment, and catering as their first preference for careers and only 4 percent chose information technology. That wasn't good news when there was a desperate need across the nation for good quality analyst programmers, project managers, business analysts, consultants, and technical specialists. Consequently many New Zealand companies were looking offshore to find the right people but many who had the most skills couldn't get into the country without the right tertiary qualifications.

Immigration consultant and Muldoon era Immigration Minister Aussie Malcolm believed there were hidden emotional factors behind the brain drain; people's perception of leadership education, health, race relations, and the crime rate, for example. "It's about national identity, feeling good about who you are and where you are." If we can't identify with what's happening here, Sydney or New York start to look attractive. Malcolm believed the immigration minister ought to have more discretionary powers to decide which industries needed skilled people and to oblige.[22]

In 2001, government claims that an inflow of immigrants was offsetting our brain drain were proven to be fabrications. The bulk of immigrants were in fact unskilled. Despite rumours of an influx of technology talent evacuating from Europe, the United States, the Middle East, and Australia in the wake of the September 11 terrorist attacks, our greener pastures without commensurate pay offerings weren't incentive enough. Most would stay put and learn to live with growing world tensions.

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While the number of Kiwis leaving long-term was significantly down, more than 170,000 emigrated in the 12 months to July 2001, including teachers, accountants, lawyers, business professionals, nurses, senior government administrators, scientists, and computer professionals. ACT party leader Richard Prebble blamed the drain on higher income taxes, the re-regulation of the labour market and the growing amount of red tape involved in trying to run businesses and employ people.[23] The Employment Contracts Act was making it harder to hire and fire people. Even our own favourite daughter Kiri couldn't help herself on a Parkinson show appearance, telling the old joke: "Would the last person out please turn off the lights." Only she had to add "It's true, they already did."

The world market for technology and telecommunications personnel was undergoing a major meltdown as many companies put spending and recruitment on hold. In fact several employment agencies described the New Zealand slowdown, which began in mid-2001, as the worst for nearly a decade. A growing number of companies were struggling, restructuring, retrenching, or shutting down, including the branch offices of a number of US operations that faced closure despite being profitable.

The pre-Y2K demand for certain kinds of programmers and technical skills created unreal expectations and many were now back in the job queues. That burst of activity also resulted in the IT infrastructure becoming more reliable and stable, requiring less support. The tech wreck had also taken its toll not only on dotcom operations but on major hardware, software, networking, and telecommunications firms with hundreds of thousands of people laid off around the world. Yet there remained a dire shortage of those with specialised e-commerce, security, network architecture, SAP, C++, and Java programming skills to take companies to the next step.

However, according to Brian Fallow in the *NZ Herald* in March 2003, the country was still bleeding Kiwis as fast as it was breeding them. "Over the past five years the outflow of New Zealanders leaving for at least a year has averaged 28,000 more than the number returning after a year or more abroad. That is exactly the average for natural increase in the population (births minus deaths) over the same period. But the natural increase is on a declining trend and the net outflow of New Zealanders is on a rising one."[24]

The continuing brain drain of our most skilled workers leaving the country for better pay and conditions elsewhere, and the concerns about whether we were training people with the right skills for existing and emerging hi-tech industries, continued to create a sense of unease.

The bulk of our exports remained agriculturally related and while we had been talking about diversity and the potential of the hi-tech sector for ages there was had been little effort to define that sector.There were high hopes that we might be capable of generating $10 billion in exports by 2010. It was hard to tell whether that was bullish or simply bullshit. If you wanted to know the size, growth potential, and export projections for the electronics, telecommunications, information technology, or software industries you had to visit numerous web sites and make endless phone calls to even get close. In fact official statistics indicated we were slowly sliding south.

Statistics New Zealand data from March 2001 showed the market had slowed to 5 percent growth compared with 7 percent in 2000. Total sales of single-user and multi-user computer hardware, communications hardware, and software and overall software sales reached $4.8 billion for 2001. IT exports overall were up 11.7 percent to $770 million. Although general software sales were up 11 percent to $537 million, software exports declined 14 percent to $97 million after four years of steady growth. At first that seemed depressing news. However the fact was the government was getting its statistics the easy way – by guessing and using old ideas of what constituted technology. If you added up the value of all the offshore software sales reported in the media each year the value would consistently blow the official numbers out of the water.

In the official government statistics, communications services – a very lucrative sector for our main players, including outsourcing and consulting contracts – was not included, and neither were electronics or embedded software. The figures didn't include software sold or downloaded over the Internet, multimedia, or services and support, software developed here by branches of overseas-owned companies or embedded in petrol pumps, washing machines, or telecommunications devices. And what about Web development and e-commerce coding?

Research company IDC suggested local software industry revenues were around $770 million in 2001, expected to grow to $921 million by 2005. It was estimated software exports alone could be around $500 million. However software companies were still loath to supply accurate information. They were already taxed on R&D spending, which could not be recovered until they had a product to sell, so that figure often ended up in the expenses column. The tax regime acted as an incentive for dishonesty and penalised pioneers. The electronics industry alone was worth around $1 billion – 75 percent of which was exported. The overall telecommunications market was worth at least $5 billion but there was no accurate breakdown of exports. If you asked Statistics for better data the answer was "Who's going to pay for the research?" IT Minister Paul Swain had promised better statistics but how that would be achieved was uncertain. [25]

ECHOES OF THE KNOWLEDGE WAVE

There it was in the *NZ Herald* on 20 March 2002: the official admission that New Zealand had missed the bus on information and communications technology (ITC). Science Minister Pete Hodgson was saying he was now determined not to let that happen with biotechnology, which is "where it's at in the next century in terms of technology."

What a statement. He said, New Zealand had missed the ICT bus because it did not have military research or a venture capital industry and the entrepreneurship that went with it. There were certainly many in the industry who would argue that in fact, hands-off government policies and monopolistic practices by certain corporates had been behind the stand-off, deflecting the focus to profits and playing safe rather than preparing for rapid social and economic change. Rather than freeing up businesses, entrepreneurs, and talented people to get on with the business of doing what they were passionate about we had overloaded them with administration and compliance costs. One estimate suggested employment relations, union negotiations, health and safety, resource management, and a range of other impositions had added about $26,000 in costs to the average medium-sized business.

The term knowledge wave appeared to have been just another catch cry, which confirmed New Zealand, as Brian Gaynor quipped in the *NZ Herald* 'as world leaders in consultative reports and advisory committees' but lagging well behind when it comes to specific policy decisions.

The government's Growing an Innovative New Zealand strategy, launched in February 2002, was another attempt to try to put some muscle behind the myth and inspire industry to the next

level. It would home in on the hi-tech sector and determine what could be done to raise the profile and the earnings. It targeted the ICT, biotechnology, and the creative industries as key sectors to promote long-term prosperity. The ICT taskforce was established to push through the objectives, which included the extraordinarily bullish goal of having 100 new ICT companies, each earning more than $100 million a year in sales, by 2012. That would mean the contribution of these sectors would need to grow from 4.3 percent ($4.8 billion) of GDP to 10 percent in ten years. The enormity of the task was underscored by the fact that just 16 companies had annual sales exceeding $100 million at the beginning of 2003 and half of them were the New Zealand arms of multinationals. ICT export sales, which were $900 million in 2001, would have to grow exponentially – in the order of $16 billion by 2012. That was a big challenge, especially in software where exports had apparently fallen 14 percent in 2001 to $97 million.

"Yes, we have set a bold target, and equally we accept that it is a target that will be unattainable if we continue to do things the way we currently do them. We have identified a number of barriers that we need to break through or remove if we are to achieve our goal," said taskforce member Ian Taylor, manager of Dunedin-based Animation Research and Taylor Made Media. Those obstacles were access to capital, tax issues that affect the ability to grow, regulatory issues that hinder rather than promote growth and an ominous downwards trend in the number of young people studying maths and all the sciences. Among the recommendations that the government would have most difficulty taking on board were calls for changes to R&D tax rules to allow full deductibility in the year of expenditure of ICT product development. The taskforce also wanted tax-neutral investment vehicles. Taylor wanted to see the government as a major buyer of ICT, adopting a more active role in buying New Zealand made. However the barrier to growth given special attention by the taskforce was lack of management expertise to take a company to the $100 million mark.[26]

It seemed successive governments, playing spin-the-bottle with the economy, had undermined our national self-esteem. We seemed determined to study what was happening everywhere else in the hope we might resolve our own identity crisis. We sent our spies to Ireland, Finland, Israel, Singapore, and Silicon Valley and invited their best talking heads to address our business leaders and further expound on how they had made the information age work for them. Despite the wave of knowledge economy talkfests in the first two years of the new millennium, there was a sense we were still adrift in a sea of hyperbole, in desperate need of a practical, encompassing vision to steer us away from the rocks.

Then just as New Zealand was again battling to keep the prestigious America's Cup on the waters of the Hauraki Gulf, in February 2003 another knowledge wave event brought together world leaders in business and entrepreneurialism to try and figure out where to next for New Zealand. The Knowledge Wave 2003 – Leadership Forum was eager to get more wind into the country's economic sails. This time Auckland University vice chancellor John Hood and his Knowledge Wave Trust involved a much broader participation than the senior business people of the previous event. There were 450 delegates; artists, actors and academics, farmers and fashion designers, small business owners and corporate leaders, central and local government officers and politicians, community leaders, new New Zealanders, and fourth generation Kiwis. Many were established leaders in their given fields, including 100 who had been identified in a nationwide search as emerging leaders. The speakers were also an eclectic lot: businesspeople, technologists and visionaries from across a range of disciplines. It was a grand gathering but many of the points raised were an echo of what had been said before. There was the harsh reality from Reserve Bank governor Alan Bollard, carefully listing our slip down the OECD rankings from 1975 when we rated ninth, to 2002. Among the 24 countries that belonged in 1975, New Zealand was now poorer than all except Spain, Portugal, Greece, and Turkey.

Organiser John Hood remained confident New Zealand could return to the top half of the OECD in economic output by 2011. But Treasury economists had calculated in 2001 that even to catch up to the average of the 30 member OECD by 2011, if all the countries kept growing at the same rate they did in the 1990s, would require more than doubling New Zealand's trend growth in output per head of population from 1.7 percent a year to 3.6 percent.

In the *Weekend Herald* coverage of the conference in February 2003 Simon Collins compiled the various viewpoints put before our current and future leaders.

Stanford University economist Paul Romer said growth depended on setting "good road rules" for the market, keeping prices stable and then creating a well educated workforce, especially people trained in science and technology. With only 5.5 percent of 24-year-olds having science or technology degrees, New Zealand lagged well behind most European and advanced Asian countries. We should prioritise education spending in these areas. However Auckland university education professor John Hattie said graduates in science and technology were among the highest in the ranks of unemployed university graduates. Boosting their numbers might simply drive more of them overseas.

Professor Richard Florida, an expert on regional development at Pittsburgh's Carnegie Melon University, offered a broader answer. Yes, of course, he said, technology was the key. But the world's most successful technology cluster, Silicon Valley, took off because creative people like the long haired founders of Apple computers, Steve Jobs and Steve Wozniak, wanted to live in the excitingly diverse environment of the San Francisco Bay. Creative people might want to be artists or rock musicians on their way to becoming entrepreneurs. They wanted to be around other creative people. So regions should foster "the three Ts of economic growth: technology, talent, tolerance."

Other ideas were more familiar. A common refrain from speakers such as The Economist *editor Bill Emmott or entrepreneur Hamish Conway was that the government could help businesses grow by cutting compliance costs in areas such as planning consents and accident compensation, and taxes. "You need to maintain the pace of flexibility of labour markets, and of relatively limited government, that was set by the Douglas and Richardson reforms of the 1980s and early 1990s because other countries are also reforming and improving their competitive position," said Emmott. Saatchi & Saatchi global chief executive Kevin Roberts said the government should find the "erogenous zones" in tax policy that would attract investors, and target tax breaks to them. He and others urged more spending on marketing the country, not just to tourists but to potential export customers, investors and migrants. "As a country we spend 0.1 percent of gross domestic product on advertising New Zealand internationally, mostly in a 'come visit' context," he said. "This is a ridiculously low sum if we're serious about growth. We're spending more money to build the new Northland prison."*

There was a lot of talk, too, about attitudes – about celebrating success, "growing up" from our colonial cringe and taking on the world. "One of the big issues we have missed over the last decade is nothing to do with the government, it's all to do with business leadership," said Chris Liddell, recently shifted from Carter Holt Harvey to the Connecticut head office of its owner, International Paper. "I don't think we have had a solid core of business leaders who have been interested in investing and competing globally rather than cutting costs and focusing on the domestic market."

Prime Minister Helen Clark stressed her action plan: seven new centres of research excellence at universities, six public-private research consortiums, 15 incubators, five new venture investment funds, 26 regional development plans, six industry taskforces and more. However her Government had chosen

a path that explicitly ruled out some, but by no means all, of the Knowledge Wave's ideas. Big tax cuts and "smaller government" along Douglas-Richardson lines were out. "If the agenda for growth is based on slashing taxes and spending, then we would not only face an uphill task financing the acquisition of knowledge and skills, but would also face resistance from a disempowered and dispirited community," she said. But she clearly recognised a need to keep looking for ways to broaden the economy and boost our living standards. "The art of governing in this respect surely rests on the balance struck between head and heart … Too much head in the form of economic rationalism can crush the spirit of the community. Too much heart can break the bank."[27]

Sunday Star Times columnist Rod Oram took a slightly different approach, suggesting we had far too many visitors from abroad downloading their knowledge to us. He said the organisers of the conference, in bringing the best of the world to New Zealand, had passed up an important opportunity to remind New Zealanders that they too generate knowledge which the world is keen to buy. Our export of services such as education, research, and consultancy had grown faster over the previous five years than the export of goods – by 62 percent compared to 50 percent. They totalled more than $11 billion in the year to September 2002, and export of services grew faster than imports, turning around a billion-dollar deficit in 1997 to a surplus in 2002, the first surplus since 1965.[28]

WHERE TO NEXT?

There was no shortage of examples that New Zealand was punching above its weight in the entrepreneurial stakes. Wellington's Weta Workshop was winning global accolades for its work on Peter Jackson's *Lord of the Rings* trilogy. Virtual Spectator, the Internet-based animation software for viewing the America's Cup, was now being sought to assist in coverage of motorsport, golf, cricket and live concerts. Researcher and AUT lecturer Vishwa Shukla had come up with a digital anthrax detection unit that had been all but ignored until September 11. Tiny Auckland firm Domain Numbers had a winning application for mobile phones and handheld devices, enabling people to use numbers to access complex Web addresses. There was sceptic Professor Denis Dutton's runaway success with his web site Arts & Letters Daily, which had been voted by the British *Observer* newspaper as 'the best site in the world,' and which sold to an Academic Partners, LLC for $1.4 million in 1999. Local security software company Marshall Software sold for $45.8 million to American firm NetIQ. Then there was 2000 chemistry Nobel Prize winner Alan MacDiarmid,[29] who discovered plastics could conduct electricity, opening the way for major technology innovation including flexible plastic transistors, electrodes, and electroluminescent polymer displays.

Whether it was Ernest Rutherford a founder of modern atomic physics, Richard Pearce, our own pioneer of powered flight, or Beatrice Tinsley, a world leader in modern cosmology, we certainly had many heroes of innovation we could look to if we were seeking evidence that we could lead the way.[30] This nation at the edge of the world, where the sun and entrepreneurs first rise, was truly blessed, but we had done little to promote innovation, encourage risk taking or promote ourselves as a nation of achievers and knowledge economy leaders. Our national budget for marketing and branding ourselves offshore – around $150 million – was pitifully inadequate.[31]

We had the Kiwi Share, ensuring free local calling, including Internet access, for all households. Our uptake of the Internet was at critical mass and the cost of access was now relatively low. At the turn of the millennium New Zealand still faced the harsh reality of the digital divide. Equitable access to high-speed communications throughout the country, not just in selected central business districts, would have been a good start.

Knowing who you want to be when you grow up is a simple question children are repeatedly asked as they head towards the teenage years, adulthood, and self-determination. The new economy required a concerted effort to define what we were good at, to clearly outline a vision, to remove the impediments to growth, and decisively act on the steps to success. Without a common vision that business, government and private individuals could passionately pursue, we were at sea with no fixed point to plot our co-ordinates to the doorstep of the world. Regardless the Kiwi can-do attitude would continue to play a pivotal role in the long-term plan. As the sign above the desk of New Plymouth–born Nobel Prize winner the late Alan MacDiarmid said, "I feel like I'm a lucky man – the harder I work the luckier I get."

The late Prof Alan McDiarmid, born in Masterton, came up with a breakthrough enabling plastics to conduct electricity. In 2000 he was awarded the Nobel prize for Chemistry; shared with physicist Alan Heeger (USA) and chemist Hideki Shirakawa (Japan) for the discovery and development of conductive organic polymers. In 2001 he was presented with the 2000 Rutherford Medal – New Zealand's highest science award.
The Edge Archive.

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E-Govt lumbers on-line

Presenting a public face

I got some wine and cheese, invited the information people from lots of government departments, sat the projector on a desk, and showed them the Web server, explaining this was now accessible from anywhere in the world. I said 'I want some money and your information.' I asserted that this was the official government Web server and nobody questioned me, although Ministry of Foreign Affairs and Trade did give me a hard time because they hadn't vetted it first.
Colin Jackson, policy analyst in Communications Minister Maurice Williamson's IT Policy group.

After becoming perhaps the first country in the world to launch an 'official' government Web server with useful public information, various agencies, and departments veered off on their own design adventure. It took half a decade to get the ensuing navigational nightmare back on course for a cohesive all-of-government Web presence.

Information technology steered an equally unsteady course with government departments gambling hundreds of millions of dollars over three decades on so-called leading-edge 'for tomorrow today' projects, which continued to swallow up cash as technology outpaced narrow proprietary thinking. Eventually there was a move back to some centralised control of core technologies, standards for accessibility and guidelines for how departments would inter-operate.

When National MP Maurice Williamson entered parliament in 1987 there was no such thing as a PC and no one was interested in investing in one. There was a typewriter for each secretary and that was as far as it went. He provided his own PC. On termination of his contract with Air New Zealand, the year before he was elected to the Pakuranga electorate, Williamson struck a deal for 12 months of cheap airfares. He flew to Hong Kong and purchased a 'cheap knock-off' IBM PC for $5200. For 1986 it was actually a rather highly configured 286 machine with a 20Mb hard drive. The retail price in New Zealand would have been closer to $12,000. So he sat proudly at his parliamentary desk bashing away at the keyboard and people came from near and far to see this oddity. He was writing a thank you letter in 'MultiMate' word processing software when Prime Minister Rob Muldoon strolled past the door. "He stopped, backed up, looked at me and said, 'Ah, so

how's the mad scientist doing tonight then, eh?' I thought, 'This is unbelievable! I'm not programming a space rocket for the moon; I'm trying to write a bloody letter!'"

Williamson had written a Dbase I database program for his mailing list so he could send letters efficiently. He was in for a reality check when he tried to find a way to output its contents: thank you letters to people who'd helped during the election. He asked administrative staff how to mail merge the names and addresses to 300–400 people. No one had any idea what mail merge meant. In the end he used direct data exchange (DDE) links, which required him to write code, associate the link with the data record and then move to the next record. "It was just impossible. I was a really good programmer and I found it difficult."

Even when Microsoft Word came out it took some time for the mail merge function to be added. "I actually remember sitting down with Bill Gates in 1993, when we had dinner here with Bolger, and I said to him, 'Well, I think your word processor is hopeless because it doesn't have proper mail merging.' He said, 'You spec out the facilities you'd want in a mail merge and we'll see if we can incorporate it in future generations.'" Williamson insists the specifications he ultimately wrote for Microsoft were key to that functionality being added to future versions of Word. "Microsoft acknowledged that to me at the time."

Williamson knew the universities had been messing around with Internetlike connections since the early 1980s but to him it didn't appear to have amounted to anything. He didn't realise what they were up to until he became associate minister of research, science, and technology in 1990, which forced him to work with the universities on information technology. "I thought, 'This is great for scientists but it will never be of major interest to your average punter.'" In fact he said the first material he saw coming off the Internet backbone, once Waikato had connected into the United States through the NASA link, wasn't even on a screen. He recalled his experience at Auckland University: "They were bringing stuff down and it was coming out on the line flow printer. It wasn't the Internet like we know it, with a mouse and a lovely big LCD screen with beautiful colours. They just said, 'We're on.' I said, 'Are you?' And they said, 'Yes, look at the little red light flashing.' So they ordered up something, 'a research paper they were looking for' and it was printed out on this dot-matrix printer where you tear along the perforations and it was appallingly difficult to read. They didn't have the proper screens in some cases and it just came through like a teletype machine."

PASSION PRIMES PORTFOLIO

In 1990, under Jim Bolger's new National Government, Williamson became the country's first information and communications technology minister. It wasn't a designation he was appointed to; rather one he lobbied for. He recalled telling Bolger that the ICT portfolio would be bigger than any other portfolio in terms of its importance to the nation in 20 years' tie. While Bolger rubbished the idea, he wasn't closed to the possibility. "I said, 'We should try to give the portfolio some credibility and status now.' It wasn't like I was asking for a budget, because Bill Birch had said, 'There's no money and a new ministry is the last thing we need.'" Williamson was simply volunteering to be 'a sort of a flag-waver and a banner carrier' for the concept.

His passion for taking advantage of technology and making sure everyone knew about his exploits and breakthroughs included assisting Finance Minister Ruth Richardson when she put together the presentation for her 'mother of all budgets' in 1991. He managed to get a copy of PowerPoint 1.0 and made a slideshow on the computer so she could present her major reforms with graphs of expenditure and an outline of what she was planning. There were no data projectors in those days so he went to a company in Auckland to convert the PowerPoint images into 35mm slides, which she could show on the wall from her rotary carousel projector.

Williamson remembers getting a call from Microsoft country manager, Chris Kelliher, who alerted him to the latest development from Hewlett-Packard. It was a portable computer that looked a bit like a sewing machine, with sides that dropped down and included a keyboard and screen. At least it was small enough to move from place to place. "We just sat there and marvelled and one of the guys actually said, 'This is the Holy Grail. We've finally found it.' Then I said, 'The trouble is the screen is too small because only people who gathered around close enough could see it.' The first projector I saw cost $25,000. I got to borrow it but the picture was so dull that if anyone dared lift the blinds you couldn't see the picture on the wall and that was in the early 90s."

His earliest Internet access was a toll call into a server in Australia that had some pertinent data on Australian politics. After getting the hang of what was possible he began to gather up the best material he could to make presentations showing the potential of the Internet. "Most of the pages, like an art exhibition from the Louvre, were actually on the CD-Rom in the drive. I never told anybody at first because you couldn't get anything like this in a reasonable fashion on the Internet but I knew it was coming. I started telling people this was going to be the new highway for the future. Railways were the highways of the 19th century, roads were the highways of the 20th and then the 21st century was the superhighway."

Williamson pushed for separate policy on information technology and wanted a group of advisors to keep him informed on Internet and IT-related issues. The Ministry of Commerce telecommunications group was entrenched with interconnection issues as the big battle raged on with Telecom and Clear. Reg Hammond, a specialist computer auditor recruited by the SSC from the electricity industry in the United Kingdom, and policy advisor Colin Jackson, formed the core Ministry of Commerce IT policy unit in 1993, providing research and advice for Williamson.

Jackson had been working as an IT consultant with the National Bank in Wellington, advising them on the transition from old green-screen terminals to a PC culture when he responded to an advertisement for a position with the IT Policy Unit. He specialised in technical policy issues. "While the job description didn't mention the Internet I knew it was going to be huge; the Web was just beginning to make an impression. I had Internet email working and the Mosaic Web browser was out so you could surf to maybe 100 sites around the world."

Hammond's first experience of the Internet had been through a DEC computer system, which enabled limited communications with other government DEC machines over X400 in the late 1980s. When Wellington City started offering free Internet he got involved, albeit mainly downloading *Duke Nukem* and other games onto a fistful of floppies for his kids to play at home. Then he experienced the Web at a Uniforum conference in Rotorua where Roger Hicks, Jim Higgins, John Hine, and others were demonstrating in the exhibition area. Most of the attendees, who were supposed to be in the conference room listening to the next address, were marvelling at the new Mosaic Web browser and the World Wide Web.

Colin Jackson

"We had been involved in email and Usenet but for me the real tipping point was the Web. It made everyone see the future capabilities. As soon as I got back to my office I insisted the Ministry of Commerce have a web site within a week. I said to Colin Jackson, 'Just get it done.'" In effect that gave Jackson the official go-ahead for what he'd been playing around with anyway. "He was a typical techo and I gave him open slather to do what he wanted. He would occasionally comment and say, 'Oh, I've just got the dot.govt.nz domain name. Is that okay?' He had a personal love of it all. Both he and I were convinced the Internet was going to

transform the telecommunications environment. The people working in telecommunications policy at the time weren't as interested. They still saw everything focused around voice networks."

Before Williamson's IT policy group was formed, computing had come under the SSC, largely centred around the GCS, which looked after the public service data centres. Hammond and Jackson were eager to ensure the government was ready for the next wave.

MP GETS STONED

The Ministry of Commerce policy people saw potential for significant economic benefit for the country and were asking what the government's role was. "We wanted people to take advantage, innovate, look for efficiencies and become more productive. While some in government liked to poke fun at Maurice Williamson, they were very open to him when he talked about productivity and efficiency, and the fact we could save billions in the large expenditure agencies of government, such as education and health, if we used technology. He told them it was good for government, the economy and the individual. He used to get his leg pulled but he was a real evangelist," said Hammond.

Williamson was convinced the Internet was going to have a big impact and kept raising the issue with Telecom but they said there were no ISPs set up to bring it here, although they were planning one soon. "The more I presented this stuff, the more I got excited about things that probably weren't even within the domain of possibility in those days. I kept talking about how you would be able to do all of your government transactions and your banking; and if you wanted to move money you would just go on-line. In those days no one had given much concern to security. I'd never thought about it much until this virus appeared on my computer, telling me it was stoned. That was the only virus I ever got. It came off someone's floppy disk, and it kept coming up. It really pissed me off because I thought 'That's wrecked my computer forever.' Then it would come right and work well for the rest of the session. It wasn't one of those things that ripped your disk to pieces and tore your data out"

Colin Jackson became a founding member of the ISOCNZ, formed to ensure the Internet in New Zealand remained open and 'uncapturable,' a word he claimed to have invented. "I used to be one of those people who got hung up about language but then I realised the relevance is to communicate what you are saying and thinking rather than a power relationship with the listener, I got less worried about inventing words on the fly as long as you make your point clear."

One of his first jobs was to give an opinion on whether the government should maintain its commitment to the OSI model. "The government had been determined to show 'leadership' in requiring all departments to install this OSI stuff; the New Zealand version was called GOSIP (government open systems interconnect profile). It was mainly designed by bureaucrats in committees that were driven by politics, which is not the way to design a piece of engineering so it's not surprising it didn't work." Besides, a growing number of government departments were connecting to Internet email as the preferred means of communication and moving away from the old X400 services based on OSI protocols. "I did my research and quickly came to a view that GOSIP was already dead and starting to smell but it would be a while before

Nathan Torkington, Web pioneer.

it started to disintegrate. I made the slightly radical suggestion that the government should use IP (Internet protocol) for everything it did."

Jackson managed to get hold of the dot.govt domain name, which had already been established for email use, and got a server running using www.govt.nz. The Ministry of Commerce wasn't averse to his experimentation but unwilling to make any investment. "I didn't like my chances of going to the IT department and asking for funding to put this strange thing called a Web server in. They wouldn't have bought that." So he went to Victoria University and sought assistance from IT department head Frank March and graduate student Nathan Torkington, who'd been responsible for introducing Web technology there and had probably built the first New Zealand web site.

Torkington claimed it was he who came up with the idea of calling the government site simply www.govt.nz. "Normally there has to be a department name between the www and the dot.govt and that was somewhat controversial. It's not the way they did it elsewhere but it seemed obvious, useful, overarching and something that we should do."

ORIGINS OF .GOVT

The domain name, synonymous with all government Internet communications in New Zealand, had its origins well before the Internet became mainstream, although there are variations on who used it first, when and why. While we use dot.govt.nz most other nations use dot.gov.

John Houlker, who looked after the Internet gateway at Waikato University, explains the .govt domain name is a remainder of the UUCP days. "You had a series of forwarding addresses for Unix email but if you came in through CSnet, the DNS was already up and running and required a domain name. We thought we'd just keep the structure rather than duplicating the Internet one. Australia did the same but later changed it over to the US way."

New Zealand universities had also been connecting to Janet (joint academic network) in the United Kingdom, which had a Coloured Book system, similar to the Internet domain name system we now know and love but with the reverse order for naming. The .ac suffix came from Janet, representing the academic community, whereas the typical US Internet domain was dot.edu, so that format also stuck when the Internet went mainstream.

At the end of the 1980s Don Stokes had been working as a programmer within the GPO, using UUCP and eventually the Internet. For its wider communications GPO produced a host table of all the different sites they were connecting to and was using the name gp.govt.nz. Stokes insists GPO was the first to use the address dot.govt.nz, well before the Internet arrived. "The name had been decided on so the DEC VMS MAIL email programme could be used across the different DEC machines and the PSInet X.25 and X.29 communications protocols that GPO used."

He said the name was styled like a domain name, as some of the sites on the list already had UUCP email or even real Internet connections. "Once we got our connection through DSIR, we continued to use gp.govt.nz as our domain. I set up our Internet-style message router to also understand the PSI addresses, so we could send to those sites directly instead of going through several store-and-forward dial-up links," said Stokes.

PIONEERING WEB CONTENT

Jackson began to look for suitable content to put on-line. He was unable to locate any official material about the MMP (mixed member proportional) electoral system so wrote his own description. This, along with a map of the electoral regions, became the first live content. Then he described the constitution 'as much as was possible' and acquired a map of the country, which he turned into a .gif graphic file.

"I rang Sir Hugh Kauwharu and asked him if I could put up his modern translation of the Treaty of Waitangi. He gave his blessing as long as I included all his scholarly footnotes. I rang the governor general's house and asked for all the information on him along with various documents from the Department of Commerce. I had to trace owners of various information and convince them to let me put it on-line. Most of them had never heard of the Internet so the task often proved quite difficult."

Having created a relatively passable, content-rich site, Jackson then dug into his boss Reg Hammond's entertainment budget and acquired a data projector the size of a suitcase for around $17,000. "I got some wine and cheese, invited the information people from lots of government departments, sat the projector on a desk, and showed them the Web server, explaining this was now accessible from anywhere in the world. I said, 'I want some money and your information.' I asserted that this was the official government Web server and nobody questioned me, although the Ministry of Foreign Affairs and Trade did give me a hard time because they hadn't vetted it first."

Jackson is convinced his efforts meant New Zealand was one of the first nations to get an official government Web server up and running, although he admitted the United States did have some material on-line before whitehouse.gov went live. His team also ran the first election night Web server with real-time results that didn't actual melt down. "I achieved that by essentially introducing a few people to each other and stood around on the sidelines cheering them on. We were very good at that. We were well ahead of many parts of the world."

He insists if he'd gone through official channels trying to get approval for these projects he would have spent a lot of time writing papers for Cabinet and trying to get his proposal past certain individuals. "I wouldn't have liked my chances." Following the Web launch cocktail party there was a growing enthusiasm from a number of government departments and piles of information starting arriving on his desk, along with a few cheques for $1000. Jackson hired a graduate student at Victoria University to cut the HTML code at Student Job Search rates, while he co-ordinated with various departments on a Web strategy, all the while trying to stay focused on his 'real job' – helping to create IT policy for the whole of government.

Some departments were soon developing their own content, planning their own Web presence and even running their own web sites on the Ministry of Commerce server, all with unique approaches. Jackson and his team developed a search engine and directory across the entire government space to ensure there was at least some semblance of order. One of the first stand-alone sites was that of Treasury, developed by American John Lozowsky[1] 'a sandal-wearing hippie-type who wore shorts and T-shirt for most of the year. He was one of the earliest government people on the Web,' and developed the first health site. The National Library, the Department of Education and Parliament itself were also early adopters.

Concurrent to Jackson's efforts the Department of Internal Affairs purchased its own Web server, which it ran from its own offices. It had managed to source funding and was building an on-line version of the government Blue Pages, which were no longer being published in the hard copy Telecom phone books. "They were far better resourced than we were so the State Services Commission (SSC) began negotiating to bring the two sites together." It brokered a deal to take over the dot.govt.nz domain and merged the sites.

Web pioneer Nathan Torkington found himself working in Colorado in 1995 and thought he'd do the patriotic thing. "In America anything the government does is public domain, including the laws of the land. There's no perceived value in keeping it hidden away or charging the public for access." In New Zealand, however, it was a different story as Torkington found when he decided to do a little public good Web development. He began gathering the laws of the nation to make them more accessible to the public and the world. "It really was in a messed-up state. It was Crown copyright and the GPO tried to exploit that. They were apparently the only ones who had the right to put the laws on-line and use them in an on-line form."

He 'crawled' every government page and began downloading relevant information. "Boy, I got into some serious shit when I spidered those guys. I got this angry phone call: 'And what the bloody hell do you think you're doing?' It seemed like a pretty ordinary event to me but they were quite disgruntled that I had been downloading all the pages. Ironically of course the Copyright Act would have been one of the ones that I downloaded," recalled Torkington. The problem was that Government Print had sold the rights and all New Zealand legislation was locked up in a private company web site. "It had pretty crappy access and so I was in a sense liberating it from them. I was going to put them into a much better searchable Web but the grumpy call from Wellington turned that off."

LEARNING TO TURN IT ON

IT Minister Maurice Williamson was still on the campaign trail with, the latest technology in hand including PowerPoint presentations, ready to roll for engagements to speak to Rotary clubs and any group that would listen. However back in Parliament the struggle continued. "In 1996 we got these old Ratheon green screens delivered to each minister's desktop as part of an internal network because they wanted to make us look like we were really hip and cool. There was nothing really on them you could use, although there was an ability to send electronic messages to each other around the system. I sent one out to all ministers, which proved to be bloody hard to do because there was no address book with an 'all ministers' category in it. I managed to get them all together and sent a message: 'If you get this, please reply to me.' The only one that replied was Jenny Shipley and that was about three weeks later when she'd logged on to see what this thing was like. I remember asking Doug Graham one day, 'Did you get my message on that new screen?' He said, 'Oh! I don't even know how to turn it on.'"

There weren't many exemplary e-government examples around the world. Brisbane, Sydney, and Melbourne hadn't done much to bring the Internet into their public service. "So Bolger did something I was really grateful for: he not only made me minister of science and technology, minister of transport, minister of IT and communications, but also made me an associate minister of State Services, tasked with dragging each of the chief executives together and 'blowtorching' them about bringing technology to their client base. I used to scream and yell at them, 'If I hear any talk that you guys have not been 100 percent co-operative in trying to get this whole IT revolution sparked through your agencies there'll be trouble.' Some were so dog-in-the-manger, even saying 'we're not an agency that will ever need to go to computers.' And I kept saying, 'I'm sorry, but this will apply in your arts and culture or roads or prison services or whatever. This revolution is going to change the way you do every bloody thing from the way you shop to the way you're educated.' And I think that we finally broke the back. It was sort of a pioneering time within the public service."

Meanwhile various government departments continued to do their own thing with no cohesive plan or standards around how their web sites were hosted, built, accessed, or navigated. Everything had evolved according to the whim of each department and it looked that way. There were, however, attempts at harmonising things to make public access more intuitive. The Internal Affairs

Department's Government within Reach (GWR) project was launched in 1995 but took two years to come up with options, and even then the bulk of proposals weren't acted on, as less than one third of government agencies showed any interest.

New Zealand Government On-line site manager Shane Middlemass said the increasing importance of the Internet wasn't understood at the time the GWR report was commissioned, and the initial government Web pages and Blue Pages Web directory were launched. It was recommended government information be available 24 hours a day through touch-screen public information kiosks. "GWR was promoting the traditional view of the kiosk, a closed network with proprietary authoring, transaction capabilities, printers and peripherals. It's fair to say there were sceptics who'd seen examples in other countries that weren't doing that well."

After considering the expense of paying for and supporting a multimillion-dollar nationwide network with all the boxes and bandwidth and interactive authoring, the kiosk idea died. In 1997 the government presence was further reviewed with a mandate to help close the gap between 'information haves and have-nots' and ensure equal access to all public data. Again some kind of public access terminal was being considered, because at this stage only 20 percent of New Zealanders had Internet access. Middlemass, who was responsible for the main government sites, made the assessment that by 2002 a maximum of 60 percent of the New Zealand population would have access to the Internet so there was an urgent need for action, although the government believed it was still too early to commit to a public network to distribute its information.[2]

WEB COSTS BLOW OUT

In February 1999 new media entrepreneur Scott Mathias warned that government-funded institutions and agencies were relying too heavily on inexpert advice when it came to developing web sites. He said the government desperately needed a co-ordinated single site where people could get authoritative information on all aspects of New Zealand.

Mathias, managing director of Auckland-based Matcom, which specialised in streaming audio and video content for the Internet, was commenting on the $3 million budget quoted by advertising agency Saatchi for a Xena-Lucy Lawless web site as part of its Tourism New Zealand's 'Destination New Zealand' tourism campaign.

Mathias said the fee was a joke and the money should immediately be redirected to a saner project. He conducted a survey among local Web designers concluding the maximum charge for a major tourism site should be $150,000–$250,000, including all the bells and whistles.

Mathias said there were a lot of brains in New Zealand but 'the people in Wellington aren't using theirs.' It was also bizarre, he said, that the government had failed to register important Internet domain names including newzealand.com, which was now run by an American company. "It gives a poor view of the country. The Internet seemed to have reached a point of atrophy in New Zealand and there was a need to aggregate key information about the country into a portal, hub or super site. People in government and business needed to work together," he said.[3]

RUNAWAY IT PROJECTS

Government departments and the computer industry received a wake-up call with the growing focus on out-of-control public service computer projects and the looming threat of Year 2000 non-compliance. The cause of many budget blowouts appeared to be the compound effect of technology that didn't do what its champions promised, changing requirements, key staff leaving, and bad management. While the departments themselves were being hauled over the coals and came under much closer scrutiny, the computer industry – specifically systems integrators, consultants, and project managers – also came in for their share of the blame. Labour spokesperson Trevor Mallard estimated the real total of cost over-runs might be at least $68 million, including missed deadlines. In his review of government technology projects he found more than 20 were at least 20 percent over budget.

There had been no overview or centralised monitoring group checking where the money was going or whether the benefits were going to be delivered on time and on budget. Early in 1997, then State Services Minister Jenny Shipley called for an immediate stock-take of all public service IT projects. The resulting report severely downplayed any problems, claiming in fact the government had managed to save $3.4 million and only 14 percent of the contracts were over budget. It was only Labour's persistence that forced the true costs into the open. In fact Trevor Mallard had to use the Official Information Act to pry data about each project from the departments concerned. He found things were far worse than he imagined and believed many of the figures provided to him may have been understated.

He slammed Treasury and State Services' attempts at assessing the problem and accused the government of mismanagement. Of the 105 projects completed by July 1998, 28 percent were over budget, with total cost over-runs in excess of $37 million. Of the remaining 45 projects still in progress 25 were expected to blow the budget. Mallard estimated total cost of 150 projects begun in the past five years – including wasted productivity and $10 million in abandoned projects – might be as high as $200 million. The fuss resulted in more reporting and accountability of technology projects than ever before. The SSC for example was broadening its scope to include smaller projects and those considered high risk and not previously audited, as well as clusters of activity that together could be considered significant. Inland Revenue, Statistics New Zealand, Social Welfare, the Department of Courts, Agriculture, Internal Affairs, Treasury, Agriculture and Commerce all had systems where cost and time exceeded that planned. However the first major project to have the whistle blown on it was the new police system.

The Integrated National Computerised Information System (INCIS) project for NZ Police was $20 million over budget and over two years behind schedule. Stewart Watson, the third project manager, had the unenviable task of pulling it back on track. INCIS began in 1994 and was meant to have been completed by December 1997 at a cost of $98 million. The budget was now $118 million. Promoted as leading the world into a new era of intelligent crime fighting, INCIS was only two-thirds completed at the end of 1998. Watson, who has been involved in several national technology projects previously, said "scope creep" was the major cause of the delays. It was important all parties agreed on the details of large projects in advance. "Successful projects don't happen by chance." This wasn't Watson's first troubleshooting role. He picked up on the replacement to the Pathway systems project for ACC after its re-engineering got out of control and scaled it back significantly. He had also been involved with the Social Welfare SWIFFT (Social Welfare for Tomorrow Today) system, one of the largest undertaken in this country. With only two weeks under his belt Watson was 'staggered' at the breadth of the INCIS project.

In 1997 Anderson Consulting had been called in to conduct an audit and INCIS was already spinning steadily out of control. It recommended major changes or canning it altogether. The report

was kept under wraps for a year and only came out in a highly censored form. It was critical of police management, claiming it took six years of planning before work was begun and there was no overall master plan. Anderson Consulting project director Ramez Katf said the recent focus on government projects should serve as a big awakening to the technology industry which 'is getting a bad name for itself.' He said both government and big business needed to better understand the complexity of large change projects. Projects get more complex as people find new things to fix rather than focusing on 'the big ticket items' and delivering something. Programme management disciplines were often forgotten. "If you miss a milestone, a red flag should go up otherwise you end up with long-time delays." Rigorous reporting and monitoring was needed. It was "pretty basic stuff," he said. "Plan the work and work the plan – ensure everyone knows what's expected of them."

Terence Pohlen, principal with Wellington-based consultancy and project management firm Pohlen Robinson, believed large projects were often hampered by a lack of scientific measurement, unskilled management, and expectations that were too high. His firm conducted the original IT audit of government departments on behalf of the SSC in 1997 and said critics often failed to consider what they're getting for additional investment. "You should ask what is being returned and whether it is good value. Government is no worse or better than any other large projects. Systems are difficult enough to build and manage let alone change, and the speed of change is coming on faster," said Pohlen. The Year 2000 threat of non-compliant computer systems failing was surely the biggest incentive of all to get it right. If new government computer systems were not completed in time for full testing by mid-1999, it was feared it might result in far more than blown budgets as the hands of the clock ticked over into the new century.[4]

ZERO HOUR FOR CHIPS

While the general populace was gearing up for new-millennium parties, there was chaos in the inner sanctums of most computer departments as staff worked overtime to ensure the technology was ready and working once the party was over.

The hype machine was also working overtime. The lifts might not work, the cash machine might ignore you, your life insurance might have expired and you might not recognise the data on your computer screen when you finally make it up the stairs to your office in 2000. Auckland's lights-out crisis had given us a taste for candles, gas cookers, and battery power, but the 'millennium bug' could cut us adrift from the sea of information and electronic transactions we had come to depend on.

A computer bug has been referred to defensively as 'an undocumented feature.' The millennium bug, while well documented, was not well understood, even by those whose very future depended on the technology it threatened. Lack of foresight by pioneering software developers (or was it built-in redundancy?) meant most computer systems relied on two digits each for the day, month, and year. However, two zeroes cannot be computed; they only add up to confusion. Everyone was busy trying to become Y2K compliant. It was feared that non-compliant PCs and mainframes might, at midnight on 31 December, travel back in time to somewhere in the 1900s, or at least reset to their purchase date. The problem mostly originated from the BIOS, which provided basic instructions for the monitor, keyboard, hard disk, communications ports,

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and other devices connected to the computer. This information was hard coded into read-only memory (ROM) and kept the computer's clock updated.

The problem was compounded if your computer was on a network in a hub, router, switch, firewall or back-up system, or if it was a mainframe, or an embedded chip in a process. Fixing mainframe and minicomputer-based systems might require rewriting millions of lines of code. Then that solution had to be compatible with all chip-based components it worked with and every other computer system it communicated with. Lives might be put at risk if hospital or aircraft guidance systems failed. Criminals could be released from prison early, financial systems could malfunction, benefits could expire, and products destroyed because they were seen to be decades past their use-by dates. All manner of commercial, industrial, manufacturing, and communications chaos could occur.

It was strongly suggested that New Zealand was taking the threat too lightly. An internal government survey in 1998 showed few departments had plans in place and many had only just begun to assess the problem. It was estimated that it might cost about $1.3 billion to get the systems of the country's 175,000 small businesses in order. Ross Wilson of Wilson White Associates predicted that unless something was done quickly about 500 Kiwi companies would fall over in the first few months of 2000 due to non-compliant systems. In an international survey Ernst & Young said only 7 percent of New Zealand respondents had completed Y2K compliance work. At the time that ranked us second worst among the 24 nations surveyed. Sixty-six percent of local respondents indicated compliance costs would be less than $860,000, but 7 percent expected to spend more than $50 million.[5]

Telecom, for example, had set aside $87 million to resolve YK2 issues, the BNZ was allocating $38 million, and the National Bank $10 million. Rather than spend an estimated $40 million fixing the bugs in its old Unisys mainframe system, the Accident Compensation Commission (ACC) opted to spend $45 million on brand-new technology. Inland Revenue was spending $3.8 million and sent out a warning in a tax pack making it clear the Y2K issue was not an acceptable excuse for avoiding tax payment. The insurance industry warned it wouldn't pay out for millennium date problems.

E-GOVERNMENT UNIT FORMED

After internal management changes within the Ministry of Commerce, Colin Jackson moved to a more hands-on technical role with the government's Superannuation Fund and became a member of the secretariat to the Prime Minister's Y2K Commission. "A lot of old software got thrown out and replaced and that's always a good thing. There was a huge momentum. It got to the point where it was a bit silly; you could have anything you wanted as long as you said it was for Y2K, which was great for technology types like myself. The downside was we spent a heck of a lot of time at work trying to show everyone that we had completed these huge tick lists and that we would be fully compliant. Along with all the planning you needed to also show that if something did go wrong, such as the power going off, that you were ready for it. Even at the Superannuation Fund we had to ensure all the IT facilities we needed to do our job were protected."

Jackson joined the State Services Commission's e-Government Unit in 2000. By this stage all

departments were making arbitrary decisions about how to go on-line, what technology to use and how web sites should look. "They all looked completely different. Decentralised government departments had a statutorily high degree of autonomy and SSC had to get Cabinet to enforce any decisions it made. Accessibility for example began to be a major issue." Jackson helped pull together some government Web guidelines, although these were largely pillaged from the UK government. "By the second revision we were able to force some measure of sameness and accessibility. It was very difficult as some departments felt their autonomy was being infringed and it involved a lot of persuading. There was a sense of don't tell us what to do."

However there were serious issues to face. A Deloitte Consulting report released in early 2000 suggested New Zealand was about two years behind Australia, Britain, and Canada in developing an e-commerce focus. The report, 'At the Dawn of e-Government: The Citizen as Customer,' said New Zealand lagged in providing government information about services on the Internet, and must adopt a more customer-focused approach. It said there needed to be provision of 24-hour, seven-day a week self-service applications over the Internet including the ability to apply for a driver's licence, housing permit, or unemployment benefit.

It suggested only 11 percent of New Zealanders could benefit from access to government services on-line at the time, although this was expected to increase to 24 percent over the next two years. That was still way behind Australia and Britain and Canada, which were expecting 34 percent of their citizens would be using on-line services. The Deloitte report found government department technology was hindering progress because it was not designed for an on-line world. The report backed up findings from a Victoria University study carried out over two years by its School of Communications Information Management, which revealed fewer than half the people visiting a government site could find what they were looking for.

The study concluded that government as a central agency needed to take responsibility across all the sites, since there appeared to be no guidelines for information presentation across the 52 main government web sites. The Ministry of Youth Affairs and the Department of Internal Affairs were rated weakest overall. The study recommended the sites be much better integrated with the main NZGO government home page.

At a conference in March 2000, Commerce Minister Paul Swain said democracy depended on e-government, and if governments were going to maintain their legitimacy they needed to be more responsive to the needs of individuals and communities. He said e-government was about addressing the new social and economic imperatives arising from the information age: "It is an issue no less important than democracy itself." He said the government's three objectives were to improve the quality of government information and services, enhance the relationship between citizens and the government, and improve the performance of government agencies.

That aligned closely with a government plan to try to close the 'digital divide,' which had the Department of Labour determined to improve public access to the Internet. Research by AC Nielsen in the middle of 1999 suggested just over 15 percent of people earning $30,000 or less had access to the Internet, compared with 30 percent of people earning $30,000–$60,000 and nearly 60 percent of those earning more than $80,000. The project to close the gap between the information 'haves and have-nots' was passed from the Ministry of Economic Development to the Department of Labour in May. The move was seen as a key part of ensuring the success of the government's plans to shift all public sector services on-line by 2005.

In its July 2001 report the SSC said there was significant potential for technology to reduce compliance costs for businesses and urged Statistics, ACC, and the Ministry for the Environment to pay more attention to disseminating information and allowing business interaction using the Internet. It said on-line publication and acceptance of submissions would be helpful in the legislative process.

Inland Revenue had made some inroads but was urged to extend the use of e-file technology to all forms, returns, and correspondence.

Statistics NZ was working with a number of companies to allow it to supply statistical information directly from their business records via electronic transfer. The report encouraged commercial software houses to create packages that enabled standard accounting processes to create statistical data in a form the department could use. The ACC was urged to make greater use of the Internet and its web site for education, providing a question-and-answer service, filling in ACC claim forms, and allowing businesses to check their own ACC information on-line. The panel also recommended the Ministry of Environment provide electronic templates for applications under the Resource Management Act and set up a bulletin board.

BUDGET TO MOVE FORWARD

In the first quarter of 2000 Cabinet gave approval for the Parliamentary Counsel office to establish a business case for a project that would allow New Zealanders to view all laws on-line by 2002. This would make authoritative, up-to-date, electronic versions of legislation available to the public at no charge for the first time. In Labour's election promises it determined to achieve on-line procurement and services, and employed a number of specialists from KPMG locally and the United Kingdom to advise it on the best way forward.[6]

Proposals to transform the way the government dealt with its own departments and the public received a boost in the 2000 Budget, with around $28 million set aside for e-government and e-commerce initiatives. In announcing the new funding, Finance Minister Michael Cullen said it was important that all government information and services were made available on the Internet. Operational funding of around $16 million over four years and capital of over $1 million was put aside for the purpose. While the Internet and e-commerce had the ability to substantially improve New Zealand's economic performance, Dr Cullen said if the country wasn't quick enough or smart enough to make these new technologies our own, we risked falling behind the rest of the world.

A further $18 million was to be spent over four years on ICT equipment in education. An allowance of $11 million over four years was set aside to promote e-commerce, most of it going to Trade New Zealand to fund its e-commerce strategy. That included educating exporters and building and marketing a series of industry-specific web sites to help them showcase their wares offshore. The balance would go towards developing a national e-commerce strategy, harmonising e-commerce law, and addressing consumer-protection issues. The government hosted an electronic-commerce summit in November to get community and industry input into developing a 'world-best' e-commerce strategy. An e-government unit was established within the SSC to develop the framework, which would be taken up by other government agencies. Paul Swain said leadership, not large sums of money, was required in the vision to develop a strategy.

Despite their increasing popularity, government web sites received a big thumbs down in published reports during 2000–2001, suggesting their usefulness and ease of navigation was far from satisfactory. The site design and navigation was described by Web designers as appalling, inconsistent, and cluttered, and they were concerned that even the latest design guidelines weren't much of an improvement. Regardless, government pages, including those of local authorities, rated consistently in the top ten sites visited by New Zealanders in any month. In three months to August 2001 almost 300,000 of the nation's million home surfers visited at least one government site.

Kerry Hawkins of Nielsen NetRatings said the number of unique hits across 266 government sites had increased significantly. The top-rated government sites in the three months to August were

the IRD, followed by NZGO or .govt.nz, Work and Income New Zealand, Christchurch City Council, Auckland City Council, and the Winz job-bank site. She believed it was a good idea for government to be simplifying access to its various domains through a common portal. "Lots of organisations are trying to do this. The University of Auckland for example was bringing all the campuses, which have their own look and feel, into a single portal to streamline everything. It makes sense for the government to do the same thing so we can see what our rates and government valuation of properties are, and change the address on our driver's licence. It would save a lot of time."

A further comprehensive overhaul was being planned with existing New Zealand Government On-line portal developments put on hold and the promise of 'NZGO on steroids' by June 2002. This was part of an overall plan to improve the way government departments communicated with each other and the public. Initially new Web design guidelines would apply to core government departments, ministries and Crown agencies, and ultimately be adopted by the wider public sector, including local authorities and SOEs.

Andrea Gray, relationships manager with the SSC e-Government Unit, said various departments were being asked to describe their content and services in very specific ways so search engines could find them and the relevant documents. Metadata describing what each site had to offer, and refining the underlying keywords was pivotal. The new portal would take a thesauruslike approach, more aligned to how people think and behave. "Normal people talk about dog registration but the government calls it canine licensing," said Gray. "This is essentially an apolitical move: everyone's committed to making a transition. It's not possible for governments to exist doing things they way they have over the past 100 years." She suggested New Zealand was quite fortunate compared with the United Kingdom, where there were 500,000 civil servants and it was even more difficult to effect change.[7] While some departments were complying, the MED's panel on compliance costs believed others were slacking. In its July 2001 report it found significant potential for reducing compliance costs for businesses and urged Statistics NZ, the IRD, ACC, and the Ministry for the Environment to pay more attention to business interaction and disseminating information using the Internet.[8]

The new e-government portal required all agencies to comply with common business processes, data standards, and systems management. This included a cross-agency extranet for secure electronic transactions. The government planned to leverage its enormous bulk-buying power to bring down the cost of goods to its agencies, and through transparent internal technology create greater efficiencies and more reliable services.

While work continued in the background, the government was being hammered for its slowness to deliver on years of promises to create a leading-edge interface to services that would automate many of its common interactions with citizens. Reports undertaken during the latest transition didn't necessarily reflect the current state of affairs.

Trade publication *Computerworld* reported State Services Minister Trevor Mallard wasn't too worried by the low rating handed to New Zealand and its drop in ranking in the e-government stakes in April 2002. The annual E-Government Readiness survey from international consultancy Accenture dropped New Zealand to 14th place out of 23 countries surveyed, five places down on 2001.

> *"Developments in our e-government programme are significant this year and I am sure that will be reflected in future surveys." One new nation in the survey, Denmark, has entered well above New Zealand and other countries that started behind us are pulling ahead faster in Accenture's overall assessment. The overall maturity score combines scores for the proportion of government services accessible on-line (service breadth), the extent to which each electronic service has developed (service depth) and the*

overall maturity in customer relationship management (CRM). Two years ago, New Zealand was in the runner-up rank, which Accenture used to call 'visionary followers,' now known more optimistically as 'visionary challengers.' In this and the previous survey we lead the third-ranked group; that of 'emerging performers,' who used to be known as 'steady achievers.'

The overall score in the survey comprises ratings for 'breadth' of implementation, recording how many agencies have implemented some sort of e-government; and 'depth' judging how far a particular implementation goes in meeting citizens' needs. The lowest depth is 'publishing,' where a citizen can read information from an agency's web site but cannot submit his/her own information … We rank 15th for 'depth' and only 17th for 'breadth,' last among the 'emerging performers' and ahead of only the 'platform builders,' those just starting out on the e-government road. Of the 140 services that the New Zealand government could deliver on-line, 121 are available to some degree, giving a service maturity breadth of 86.4%, Accenture said. "This is consistent with the global average and is an improvement on the previous service maturity. For example, citizens can email their inquiries to the New Zealand Parliament web site." New Zealand has made little progress in implementing mature services in the revenue sector, where delivery remains at the 'publish level,' it records.[9]

WATCHING THE WATCHERS

While the events of September 11 may have opened the way for greater electronic surveillance of citizens, Internet-based e-government could help counter that by empowering citizens. "If the government is going to pry into our lives a little more we also need to be able to pry into the government's life," proffered Internet democracy campaigner Steven Clift in October 2001.

Addressing the BayCorp-SmartNet Knowledge Navigators workshop, Clift said the terrorist attacks had helped cement the Internet as a fundamental infrastructure, built a new sense of community, and underlined the importance of using the Internet to enhance democracy. People would now pay a lot more attention to how the Internet could be used to bring communities and families together in times of crisis, providing essential information and communication. "When the phone lines are bogged down the email will still get through."

He said paranoia about using snail mail due to the anthrax infections was mainly focused on the East Coast of the United States but had had a big impact on businesses and mailrooms. "Imagine the anthrax crisis without the Internet and its ability to send large documents. It's helped keep things going. If we relied solely on the physical mail we'd be a lot more at risk." While concerned about legislation passed in the midst of the crisis, giving governments and their spy agencies increased power to electronically pry into people's affairs, he believed some of those measures might be overturned. "I wouldn't be surprised if a lot of things are found unconstitutional when put to the test."

The way to counter stronger government which seeks greater controls over its people is to use the Internet and its related tools to build a stronger democracy. "Just as the Internet can be used to spy on people it can also be used to have greater control over the government, providing more openness, more accountability and more accurate decision making information." Clift

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believed New Zealand was leading the way for e-government. "It's the right-sized county: you can get your hands around it and experiment. The biggest Holy Grail is transaction services and it continues to be rare for any government service to be completely transacted on-line."

He said Internet technology opened up the processes so citizens could reassure themselves that parliaments and city councils weren't just automating what they do but providing community services that people want. "It's up to governments to design their systems so there's customer feedback, focus groups and useability studies so they can more wisely invest their e-government dollar. It has been rare for governments to comprehensively measure what they're doing with their investment."

He said e-government may be the on-line business model that actually works because it doesn't have to turn a profit or even show it's recovering costs. "It may not be commercially viable but provides access to information and services that are needed in society that wouldn't exist unless government produced them. This helps present the Internet as a utility – a substantial tool – rather than a brochure or pop-news based on advertising revenues," said Clift.

The ideal e-government would make citizens feel closer to their government and ensure they were getting something for their tax dollar. "It can present a comprehensive view of government that has not been available until now. You should be able to see what every little agency is doing and how connected or disconnected they are to other agencies."[10]

BULK BUYING BLUSTER

In September 2001 the government called for proposals for a government electronic procurement project. Inland Revenue, Work and Income, the Fire Service, Treasury, and MAF were to be involved in the initial pilot. It was to have run until mid-2002 when a final decision on wider e-procurement would be made. Project manager Greg Nicholls, from the SSC's e-government unit, believed there were savings to be made from syndicated procurement and process improvements building on an earlier pilot involving Work and Income. The big guns were gearing up to try to win the business, including Oracle, iPlanet, and Accenture, which had been on the acquisition trail and established a dedicated unit in New Zealand to deliver e-procurement services. There was also SupplyNet, which had introduced the latest version of the Commerce One MarketSite e-commerce management system. Also in the picture would be local player e:\\volution.[11]

According to the SSC the e-procurement system would enable government agencies to transact $1.25 billion a year with suppliers over the Internet. It was also looking at introducing e-billing. California-based Porterra was chosen to provide an e-commerce portal for sharing information between departments across a WAN. A decision was also due on a common technology infrastructure which would leverage existing government network systems. Official funding for the transition was only $16 million over four years; individual agencies would be required to cough up the rest from their own budgets.

Then the Parliamentary Counsel Office signed a deal with Unisys to create a free-access database of New Zealand's legislation on the Internet. Access was costing $220 a month or $1 for a search and $1 a document downloaded from the Knowledge Basket site. The emerging e-democracy, we were told, would enable instant public access to government information anytime, anywhere,

from any device. More than 40 percent of government forms and documents were available on-line, with wider access to a free-access on-line database of legislation promised by the end of 2002.[12] However the launch of the super portal planned for June 2002 slid out to July then was put on hold until after the elections. The delay was blamed on a need to further improve the portal's search engine, which had been found to have a few bugs.

The government finally launched its $5.6 million Internet portal offering structured access across the web sites of government agencies on 14 November 2002. There were concerns that the growing move to working electronically might not be in the best interests of some citizens. The Citizens Advice Bureau (CAB) thought this was just another step in government cost cutting that had seen so many departments close their front-line offices and rely on call centres for communication. CAB Chief Executive Nick Toonen said while on-line access would improve information flow, it was no substitute for person-to-person contact – something the CAB was increasingly having to provide as the government withdrew its physical presence from local communities. The government wanted the portal, costing $4 million a year, to become the dominant means of interaction with citizens by 2004. CAB was concerned that the 63 percent of New Zealand homes that didn't have Internet access would miss out on on-line information and social services.

The portal (www.govt.nz) was officially launched by Prime Minister Helen Clark at the Mt Wellington Community Library in Auckland. The library was charging $8 an hour for Internet access on its computers. Asked if there was any policy to provide free public access to the portal, Ms Clark said, "One step at a time." There were still few services allowing citizens to complete transactions on-line, but there were plans to increase this over the next two years. State Services and the IRD were investigating technologies to uniquely identify users over the Internet and policy decisions were yet to be made on whether departments such as Justice and Land Information, New Zealand, would reduce their fees for electronic information or provide it for free.[13]

In October 2002 New Zealand was part of an international survey of public use of e-government. The results showed broadly that New Zealanders were aware of e-government and were likely to use it to find information and services from a single search, learn about entitlements and for convenience; for example to be reminded of obligations such as driver's licence renewal. Businesses were also in favour of e-government, particularly if it meant lower compliance costs and more efficient delivery of information and services 'in an easier, cheaper, more accessible and responsive, integrated, and customer-oriented way,' so they could more easily meet their legal and regulatory obligations.

There were, however, concerns that if developed unwisely e-government could create inequities in public access and service delivery through inappropriate closure of offline channels. It could compromise privacy and security of personal information and add additional costs to the sector, including the need for more staff or increased costs of technology and training.

REFOCUSING THE E-VISON

The vision the government adopted in June 2003 was broad ranging and included clichéd 'world leader' aspirations. The three-point mission was that by June 2004 the Internet would be the dominant means of enabling ready access to government; by June 2007 networks and Internet technologies would be integrated to deliver government information, services and processes, and by June 2010 government would be transformed through the use of Internet. People would have a choice of channels to government information and services that were convenient and easy to use. Information and services would be integrated, packaged, and presented to minimise cost and improve results for

individuals, businesses, and providers. People would be better informed and better able to participate in government, the strategy stated.

The government conceded the public sector had become fragmented, operating from a collection of silos that did not work together well, which made it hard for people to deal with the public sector as a whole. The view was that e-government should enable a more networked approach, where agencies acted more coherently. An all-of-government web site would be a first step in the transformation based on familiar-sounding goals. "Successful government will become synonymous with processes and services integrated across the traditional boundaries between government agencies, rather than ones confined to compartments. It will also mean people being able to participate more readily across a spectrum of public sector activity and processes," said the e-government strategy summary.

So how to get there? The government's answer was 'a service delivery architecture and an agreed set of information and technology standards.' The development of shared public sector data resources; building an infrastructure of shared software and hardware; and finding innovative ways of conducting business between agencies, and with citizens, customers and stakeholders was also cited. [14]

PARLIAMENTARY PORTAL POPULAR

In parliamentary questions in November 2003 Labour Minister Mark Gosche asked State Services Minister Trevor Mallard for an update on Internet use to access government services. Mallard, one day before the portal's official first birthday, responded, "The portal now has some 5500 local and central government services and information resources listed. It receives some two million hits a week – a figure that has been climbing steadily since the launch."

He said every day it was transferring more than a gigabyte of information. "I am informed that that is the equivalent of 260,000 floppy disks per year. The top ten most requested search items from the portal are laws, job vacancies, tax, immigration, education, business, health, Maori employment, and government." He took the opportunity to deliver a quip about deposed National Party IT and Communications Minister Maurice Williamson: "What people have not been able to access is when the only person opposite, with a good understanding of information technology issues, is to be promoted back to the front bench, where he belongs."[15]

In a press release in August 2004 Mallard again reported the now 'award-winning'[16] portal was receiving more than 22,000 visitors a week, a 26 percent increase over the same time in 2003.

"What is particularly encouraging is that there has been a 36 percent increase in the number of domestic visitors to the portal, nearly 3500 per week," he said. There were an average 13,000 domestic visitors a week. A survey by Victoria University confirmed rural people were high users of government on-line, greatly appreciating the ability to contact governments at a time that suited them. The survey also found that more than 70 percent of the participants used government sites on the Internet.

"Making government services more accessible and more responsive to the diverse range of needs of New Zealanders is a top priority for our

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government. If a farmer wants to log on and download information before feeding stock in the morning, the portal helps them to do this." Mallard promised future developments for the portal, currently being carried out by the SSC's e-government unit, would enable even easier access and increased functionality."[17]

Late in 2003 government departments were beavering away on more than 100 unfinished e-government initiatives, according to a survey conducted by the SSC. Its e-government unit surveyed 36 public-sector agencies, which provided details of 150 separate initiatives, a quarter of which had been delivered. Two flagship e-government initiatives had already run into trouble. A multimillion-dollar Parliamentary Counsel Office project to electronically draft legislation and publish it on the Internet for free was facing an internal review. And the long awaited e-procurement project led by the SSC to enable government departments to buy from suppliers over the Internet was scaled back early in 2003 and would no longer deliver all the functionality originally planned.

Among new on-line plans were a decision to trial Internet voting in a constituency in 'middle New Zealand' in the 2008 general election and to routinely publish court judgments on the Internet for free public access. The Labour Department was pushing ahead with plans to expand its worksite job-related portal while Inland Revenue had a wide-ranging e-enablement programme. According to the SSC, agencies said their initiatives were primarily driven by the promise of improved efficiency, cost-effectiveness, and a better quality of service delivery. About one-fifth of the e-government projects involved collaboration between different agencies.

ITANZ executive director Jim O'Neill said the IT industry was seeing 'a steady flow' of government work but it was still sporadic. 'Meatier' projects in the pipeline included establishing an on-line authentication system for people accessing government services over the Web, and IT security work flowing on from September 11. "There are going to be big security-related projects that flow from being part of the worldwide trading community. Government purchases account for about 40 percent of the New Zealand IT market and are a mainstay for the big multinational IT players."[18]

Jim O'Neill, former ITANZ chief executive.

According to a government survey, about half of New Zealand now used the Internet to access government pages. Their main reason was seeking information and a growing number were downloading official forms to submit later by post or fax. Increasingly we were supplying personal details to government departments over the Internet and paying for products and government-related services on-line using our credit card or bank account numbers. In all there were about 266 government sites and the best way to maintain sanity while navigating them was to start from and return to the new central portal (www.govt.nz).

You could register a new company at the Company's Office or get comprehensive, although somewhat outdated statistical information from Statistics NZ's web site. To make life easier for people paying tax the IRD had been working to make more of its services available on-line and more intuitive to use. It already allowed financial advisers to file individual tax returns and companies to file monthly PAYE information on their employees. It had received 69,000

GST returns since the on-line service went live in January 2003 and more than 3000 IR3 returns were filed electronically since that became possible in April. Companies had been able to view their returns and related forms on-line since September.[19]

The e-government vision was seen as a great queue jumper. Instead of waiting in line to register a vehicle, you would be able do this from home or the office. After an accident you might need to talk to the public hospital, ACC, and Winz outlining your circumstances and needs. If those three organisations had the ability to share information and integrate their services, you might only go through that process once.

The emerging e-democracy, we were told, would enable instant public access to government information anytime, anywhere, from any device. Ultimately citizens would be able to provide feedback about quality of services or content, and contribute to proposed policies or legislation. The challenges ahead included not only bringing together in a coherent fashion all government information, forms and services, and ensuring these could be accessed by all citizens but wading through all the jargon and legalese so it could be understood by most of us without the help of a lawyer, consultant, or other high-charging, third-party interpreter.

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Clicks and mortar

Beyond on-line pamphlets

Many e-tailers will go broke early next year. They have been using venture capital money or the proceeds from recent share issues to pay for their marketing campaigns. Many Internet investors, therefore will do their dough. Many will become wary of Internet start-ups but others will be stronger because their customer base will have expanded. In a perfect world, therefore, the quality of investments should improve as the winners go from strength to strength.
Alan Deans, New York View, *NZ Herald*, 26 November 1999.

When bar code readers and Eftpos machines became commonplace in supermarkets, ATM machines popped up on street corners, and shoppers had to shuffle through a wallet full of plastic to make regular transactions it was clear the world was changing.

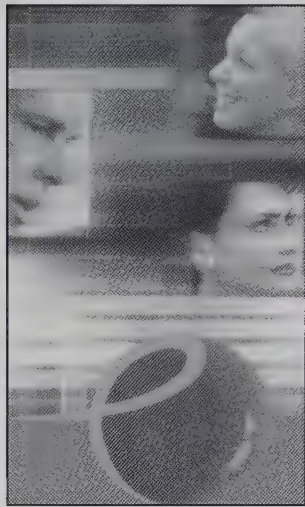
From the early days of electronic transactions, New Zealanders were leaders in the use of barcode scanning in the grocery industry and had one of the most comprehensive seamless Eftpos payment networks in the world. We weren't part of the prophesied cashless society yet, but we were certainly carrying less cash. We had been in the top ten countries for Internet access on a per capita base since 1993, our cellphone use was among the highest in the world, and we took to Internet banking and shopping with vigour.

There were two electronic funds transfer at point-of-sale (Eftpos) networks in New Zealand, both owned and operated by the major trading banks. Eftpos New Zealand was operated by the ANZ bank.[1] Electronic Transaction Services (ETSL) was run by a consortium of BNZ, ASB, Westpac Trust Bank, Countrywide, and the National Bank. During the late 1990s, the number of Eftpos terminals doubled. By 2000 there were 60,000 terminals in operation, one for every 60 people – the highest penetration in the world. Both networks underwent major technology upgrades between 1999 and 2001 to cope with burgeoning transaction numbers.

Our high penetration of PCs and the explosive growth in Internet access meant many users were now comfortable with doing a lot more than Web browsing. By the turn of the century on-line tools were focusing on small to medium enterprises. Given the demographics; more than 85 percent

of our businesses had up to ten employees, there was a good opportunity to compliment bricks-and-mortar storefronts with an electronic shop front on the Web.

Initially there were business and consumer jitters about transacting on-line but once everyone was confident email and credit card payments were actually getting through, and the goods were arriving by snail mail, the focus began to shift. As security issues were overcome and the marketing machine of both the government and the commercial sector ramped up, e-commerce went beyond books, CDs and software to serious on-line buying and selling. New Zealand followed the global trend with the Web becoming the shopper's new playground.



The cover of the government's e-commerce strategy promo.

> *Use of the Internet is booming all around the world, bucking the global economic downturn and the crisis in the information technology industry, according to United Nations figures. An annual report by the UNCTAD trade and development agency forecast registered Internet users could total 655 million by the end of 2002, a year-on-year increase of 30 percent. At the same time, the value of electronic commerce – goods and services bought and sold over the Internet – could reach as high as US$4.6 billion this year, a 50 percent rise from last year, climbing to around $7.8 billion at the end of 2003.*
>
> *The UNCTAD report, which quotes figures from another UN agency – the ITU – are watched closely given the absence of any reliable statistics on global e-commerce, which analysts say are still difficult to compile. UNCTAD said in its 'E-Commerce and Development Report' that growth rates around 18 percent of all purchasing by firms and individuals could be done in cyberspace by 2006. The forecast figure for the total of Internet users by the end of this year would take the number of people using the system – whether for seeking information, messaging, or purchases – to one tenth of the world's population.*[2]

The groundwork for e-commerce had been established through the earliest e-commerce networks which had settled on electronic data interchange (EDI) as a set of standardised message formats, for businesses to exchange purchase orders, invoices and other essential data. A number of large businesses and their suppliers and customers were heavily involved in EDI from the mid-1980s, but it was a highly proprietary approach. It required messages to be exchanged through dedicated value-added networks (VANs) limiting its use to large organisations with sufficient clout to impose EDI standards on their supply chain partners. In fact the high level of investment and commitment to EDI became something of an impediment when the more open Internet-based approach to on-line transactions first raised its head. There was still some resistance even when the World Wide Web was clearly maturing as a commercial platform in the early 1990s.

ON-LINE GROCERY EXPERIMENT

Woolworths had pioneered on-line sales in New Zealand in a costly but valuable learning exercise. Its on-line shopping site was established in 1997 and cost tens of millions of dollars to get right. In perspective that was still significantly less than setting up a single bricks-and-mortar store. The

company sent out a CD that enabled on-line customers to navigate virtual grocery aisles and tick off selected items that would then be delivered to their door by a courier van. Parent company Hong Kong–based Dairy Farm International had interests in Australia, Singapore, and Hong Kong and was certainly using New Zealand as a test case to help it understand how to introduce electronic shopping across its other chains.

While the Internet brought standards to communications, back-end business systems were typically islands of automation. The challenge was in translating an order placed over the Web into instructions to the warehouse to pick those items for delivery, bill the client, and then restock inventory accordingly. Without an auditable data trail the result was often confusion. New network connections and processes were needed to cope with the disciplines of e-commerce, and the right relationships between partners in the supply and distribution chain also needed to be literally secured.

Initially the big database and enterprise resource planning (ERP) companies and systems integrators tried to play in the Internet game by cobbling everything together for the larger firms. As the technology got smarter, smaller, and more affordable, ISPs began to partner with software developers and banks to make their own mark on the next phase of development.

ASB customers could deposit and withdraw their money anywhere in the country from 1983 after it linked the computer systems of its 12 banks. It also installed the first Eftpos terminals and ATM machines and in 1998 set the pace for on-line banking, with the introduction of its FastNet and BankDirect services. With help from Microsoft its Fastnet service was further developed in 1999 allowing customers to download bank statements to their own accounting software.[3]

In its report 'Internet Commerce in New Zealand,' released at the end of 1998, research group IDC estimated Internet commerce activity here would reach US$108.2 million and by 2002 rocket to US$546.8 million. Medium to large local businesses were expected to account for US$36.5 million of e-commerce transactions in 1999. The percentage of on-line shoppers continued to grow rapidly from 17.8 percent in December 1997 to an estimated 31.1 percent by December 2002. IDC researcher Patrick Pilcher said B2B e-commerce was more manageable, with a closed universe of trading partners and regular, manageable transactions with benefits showing up immediately on the bottom line. "It is going to become a key commercial differentiator resulting in a fundamental shift in the way people do business." He believed new packages from Telecom and Telstra offered a potent enabling option for small, medium, and large businesses. The new e-commerce offerings were essentially providing a cyber store into which customers could plug their product catalogue and HTML code for their Web pages.

Obstacles to e-commerce included not having the right banking clearance systems in place so overseas Internet shoppers could use credit cards to buy goods here and pay with their own local currency. This was seen as a deterrent to international shoppers who might want to buy in New Zealand. The ASB and BNZ were looking into solutions, but it was perceived as high cost and high risk, at a time when e-commerce was still finding its feet and issues like Y2K compliance were taking precedence. Many businesses were taking orders electronically but still requiring the traditional cheque in the mail or a 24-hour or seven-day hold while credit cards were processed and cleared manually. There was also the cost of transaction fees for businesses with high-volume, low-margin goods, and the proprietary nature of solutions geared to work with one bank and not others.

Woolworths was keen to move to electronic clearance but had difficulty with the business case. "We won't take credit cards yet simply because of the two percent fee loading by the banks for on-line credit card transactions. We don't believe that's appropriate for this environment – we operate at a 2 percent or less margin and don't want to have to put our prices up," said e-commerce manager Richard Harrison.

Incompatible systems internally and between businesses also presented a challenge to larger companies. Early in 1999, IT coordinator for the Fletcher Challenge building division, John Bunn, was examining the opportunities and threats. Fletcher's saw great possibilities for combining buying power across the group and was examining the information systems needed to support that. "We need to make the process efficient but we have so many ERP packages we have to think how we achieve a consistent approach across such a mixture of platforms."

E-COMMERCE CATALOGUE BROADENS

The Warehouse had also been involved in on-line trials from 1997. Clothing retailer EziBuy had 20 percent of its catalogue on-line, and Christchurch-based Estar On-line set up music site CDstar.com in 1999. The New Zealand Wool Group's Woolnet trading system provided a secure system for on-line deals, transferring funds from the buyer's account until an agreed settlement date once goods had been delivered. Foodstuffs was taking the challenge seriously, having committed to swap from paper purchasing and hard copy invoicing systems to a full electronic system that could eventually encompass thousands of retailers and suppliers. Its Pak 'n Save and Four Square co-operatives planned to link into an e-commerce system over several years.

Rather than the expensive option of going with EDI, the standardised IP approach had removed huge costs from e-commerce. SAP, PeopleSoft, Baan, Oracle, and other competing business packages, which sought to dominate everything from manufacturing to warehouse, distribution and accounting functions, were rapidly reworking their high-end systems to handle Internet e-commerce for SMEs. Microsoft had the SME firmly in mind with its new BizTalk framework for e-commerce, promising all the tools to build and manage web sites for buying and selling, advertising, promoting, and accessing large database and catalogues on-line. Locally Advantage Group co-developed the Ezibuy secure e-commerce product with the BNZ. Glazier Systems had its Epas package and the ASB was using Microsoft technology. A stream of developers were building add-ons while Unisys, Cardinal, Terabyte, Zivo, and a dozen others were tightly focused on customising business web sites.

Ernst & Young was beginning to offer a worldwide service promising to get businesses on the Web within 30 days, and other accounting and consultancy firms were right behind them. Telecom had a new division engaged in building on-line commerce sites using its Business Builder and Commerce Builder products. Telstra had jumped in with secure buying and selling through Surelink, a secure financial settlement package it borrowed from its parent in Australia. Having provided Telstra with their payment details once, customers could trade at Surelink accredited sites. It was the first in a family of products including bill payment and B2B purchase ordering.

Despite the flurry of activity, Price Waterhouse Coopers' Information Systems Risk Management division found Internet use was yet to enter the realms of revenue. In 1998–1999 New Zealand's many businesses were still deciding how and where e-commerce would fit into their organisations. Only 13 percent were using the Internet for business transactions, which compared favourably with the United States and Canada. In all about 60 percent of New Zealand organisations were connected, with MIS departments leading the way (60 percent) followed by operational management (26 percent), sales and marketing (19 percent), clerical staff (13 percent), and executive management (13 percent).

Spending trends in 1999, however, suggested the inertia wouldn't last – 55 percent of New Zealand's organisations said they would be spending $500,000 on e-commerce by 2001 and 10 percent would top that. There were no great expectations that this investment would pay off in a hurry though, with 86 percent of the groups expecting to gather less than one percent of their revenue from on-line business initially and the remainder, mainly in the telecommunications and

technology arena, were expecting 30 percent of sales to be made electronically. A lack of standards, a shortage of skills, and scepticism about security were perceived as the major obstacles.[4]

EMPOWERING ON-LINE TOOLS

It was clear the Internet could help improve customer service, increase competitive advantage and lower costs, but it took several years before the business case for major investment was compelling enough. Even when it did begin to make sense it took time for e-commerce to move beyond IT departments into the mainstream. The greater focus was on internal efficiency, through technology such as imaging and document management, data warehousing, workflow, and multimedia applications. Getting the communications infrastructure right with Ethernet, ISDN, and ATM technology were considered more important in the meantime.

As the large telcos migrated entirely to the Internet protocol and 'always-on' IP dial tone, the pressure was on traditional ISPs to lift their game. Even the key differentiator of speed was losing its appeal unless this was coupled with quality of service and high security. The home pages of most ISPs were no longer glorified pamphlets for services offered but commercial portals, hosting news and weather, sports and community information, and acting as jump-off points to their own cybermalls. In the first wave of diversification a number of ISPs were acquired or had partnered with Web or database developers to take businesses on-line with interactive catalogues. Unless they could deliver specialist technical skills and services or become aligned with robust, cash-rich partners they were facing a further market shake-out.

Xtra, ClearNet, Ihug, and Paradise.net, who had been in serious consolidation mode since 1999, were now offering a wide range of tools and bundled offerings for SMEs and large corporates. They and a growing number of IT outsourcing and development firms were moving deeper into the business infrastructure, building intranets and extranets[5], providing local area network support, or becoming application service providers (ASPs). Voyager was using Microsoft's Commerce Site Server with a back end into the ASB using 128-bit encryption and was able to accept major credit cards. Iconz was offering credit card authentication and processing based on Glazier Systems' Epas and ETSL's Eftpos network.[6]

Communications Minister Paul Swain. TUANZ Archive

Only weeks before they were voted out of office, in October 1999, the National Government launched its e-commerce initiative, several years after governments in Australia, the United States, and Europe had begun to formulate their own policies. The new Labour government indicated it would take a leading role as its own activities would comprise a third of the electronic economy and could have an enormous impact on national e-commerce activities. The objective was to have all New Zealanders able to register forms, make payments, and communicate with government on-line by 2005.

In drawing up the party's e-commerce policy Labour MP for Rimutaka, Paul Swain said key planks were an e-commerce summit, a single Internet window for all transactions with the government and a review of Telecom. "What is needed is smart ideas like strategic interventions where the government works in partnership with industry to maximise opportunity in what is now obviously the global economy." Within its first term Labour had prepared education programmes to help SMEs become involved in e-commerce. "We want a unified e-commerce purchasing regime across central and

local government. That means you will be able to go into a window, see purchasing, click on that and see the chairs, tables, teacups, and saucers available across the whole range of departments." Labour said it would promote harmonisation of the rules on intellectual property rights, consumer protection, and tax. It would encourage foreign investment in technology, and promote debate on digital signatures. Swain said Telecom's dominance was creating roadblocks on the information superhighway and no government could sit by and watch that happen."[7]

DOTCOM CRASH FALLOUT

Elsewhere the 'new economy' had taken on a life of its own. The hi-tech companies of Silicon Valley in California and their equivalents in the United States and other parts of the world were going gangbusters. Stock-market values were skyrocketing. The hype machine had been in overdrive, talking up company intentions, planned product releases, new ideas, and innovations as if ideas themselves could be traded. Dotcom madness had businesses buying up domain names for millions and poorly performing listed companies, adding an 'e' and an Internet developer overnight in the hope stock prices would magically soar. Many of the new entrants were simply marketing exercises looking to join the race to profit without manufacturing anything but an illusion.

Everyone, it seemed, was expecting to make a killing. The problem was the dead and dying left after what happened just before Easter 2000 were gullible investors, who lost fortunes after speculating on vapourware and over-valued companies, and the hopes and dreams of thousands of geeks, hi-tech experts, and marketing people who suddenly found themselves without a job.

Paul Allen, co-founder of Microsoft, sold 24 million shares worth NZ$4.6 billion just before the Easter crash. Either he knew something or the imminent court decision of the US Department of Justice planning to break up the software giant helped him on his way. On 14 April 2000 Wall Street experienced its biggest one-day fall in history, concluding a week in which US markets lost $2 trillion in value, the equivalent of Germany's entire economy. Worst hit was Nasdaq, the stock exchange favoured by hi-tech companies such as Microsoft. Bill Gates saw his personal fortune drop $30 billion in a few hours, almost toppling him off his perch as richest man in the world. Immediately Amazon.com and other pioneering e-commerce companies began laying off staff.

Like Y2K before it, the e-crash was a wake-up call to investors and board members about the volatile nature of the Internet, and a market that could be brought to its knees virtually overnight by the speed at which rumours could now travel the world. Despite the heavy losses, most stock traders accepted the fact that new technology shares were grossly overvalued. Many who had committed to e-business hit the pause button while the dust settled. The ongoing global dervish dance of lay-offs, cutbacks, takeovers and shrinking profits quickly forced Kiwi businesses to step back and review what constituted stable business reality. One of the reasons many pioneers in the field had failed was a lack of a sound business strategy and an inability to handle the pressure behind the front lines.

In an ideal world you key in on-line information once, and set in motion an electronic chain of events that generates the correct instructions for suppliers, distributors, and customers, so goods are delivered and the shelves and warehouses are replenished accordingly. While many suppliers had fancy web sites, orders were still being processed by printing out email orders, sending faxes, or rekeying data. With so much proprietary technology around, many companies ran the risk of being stranded in e-commerce babel if they couldn't share the same document types. A growing number of larger organisations required suppliers to adhere to their standards and way of completing transactions. If a business was to be involved in the wider trading community, the bottlenecks, islands of information, incompatible code, and missing links had to be sorted out or they would became a weak link in the supply chain.

Even if things had moved beyond people placing paper in pigeon holes, and the plumbing and document translation were right, there was still no guarantee of success. The right products, marketing, management, and customer response systems were all necessary. An increasingly e-literate breed of executives realised they needed to take the reins of technology, rather than being held to ransom by it. IT strategies and purchasing decisions began moving from the backroom to the boardroom as fragmented organisational structures were reviewed and integrated to present a united face for the next wave of e-commerce. The incentive to get it right was a confident expectation, that once the right internal systems and external relationships were in place, e-business was the gold at the end of the rainbow.

The challenge for all organisations was to sift through the lessons of the dotbomb debacle, be aware of what both partners and competitors were doing, and ensure internal systems, departments, and processes were in order and talking seamlessly. Properly integrated into a business strategy, the e-word would cut out the paper chain, reduce queues and bureaucracy, and lead to instant access to information and increased profitability. After all business was still business, and clicks and mortar were complementary. The principles of success at street level – reputation, quality, pricing, and service – were the same in cyberspace. There were no shortcuts to building trust and loyalty. In fact there was less tolerance on the Web for experimentation, srcew ups [sic], bad design, or slow service.[8]

In 2000 various surveys produced conflicting images of where New Zealand was at in terms of e-commerce, although there were clear indications the new approach was starting to catch on. With more 'seasoned' Internet users than many comparable nations, New Zealanders may not have been spending as much time on-line as their peers, but they were clearer about why and where they went. A quarter of million New Zealanders had made on-line purchases, with an expectation this would grow to a million on-line shoppers before 2005. Research indicated they would spend more than a billion dollars shopping on the Internet in 2001, up from $16 million in 1997. The growth of e-commerce would at first be driven by B2B, according to researcher Paul Budde.[9]

IDC business development and consulting manager Mike Cranna believed the real 'year of e-commerce' was yet to come but there was every reason for businesses and consumers to feel confident with an increasing number of security solutions and affordable applications arriving. A lot of the basics were fairly unromantic. "It's just routers, cables and software. Once you've got those in place, if you manage your project carefully and ensure your suppliers are able to deliver what they say they can, there are significant savings to be made." Given that the previous government did virtually nothing, the actions of the present Labour Government were being positively perceived.[10]

PUBLIC VISION PUSHED

In its Budget 2000 announcement Labour had dedicated more than $11 million over four years to promote e-commerce in New Zealand. Minister of Commerce Paul Swain said this would show how serious the government was about helping New Zealanders benefit from the new economy. "Our vision is for New Zealand to become a world leader in the smart use of electronic commerce. We have a lot of work to do in making sure that all people are able to use the new technologies, but if we do things right the whole country stands to benefit."

The budget provisions included cash for developing a national e-commerce strategy in consultation with industry and citizens to harmonise New Zealand's law on e-commerce-related consumer protection issues, and $9.5 million over two years for Trade New Zealand to implement an 'e-commerce for exporters' strategy. The TradeNZ funding was to help small and medium exporters gain access to the new global economy and increase overall export earnings through trading on-line.[11]

A MED survey commissioned in August 2000 had BRC Marketing and Social Research look into business use of the Internet to provide background information for the government's e-commerce strategy. It indicated small to medium businesses were ahead of their Australian counterparts in their ability to exploit the potential of the Internet. Over two-thirds (68 percent) were using email, and one third had their own domain name and/or web site. Only 7 percent did not use computers at all. Almost all businesses with 20 or more staff (94 percent) were connected to the Internet, and 68% had their own domain name or web site. After email, the leading use of the Internet was information gathering and research followed by ordering goods and services, and on-line banking. Just over one in four businesses was using the Internet to sell goods and services.

The telephone survey of 504 respondents indicated that although New Zealand businesses were well prepared, they had yet to come to grips with the implications of e-commerce. While two-thirds claimed to be engaged in some type of e-commerce with other organisations, only about one in ten had integrated this activity with their internal business systems. E-commerce was seen as important for information gathering, developing the customer base and maintaining competitiveness, but despite its international reach, only a minority of businesses saw its ability to grow exports as being a major benefit. There were no single inhibiting factors although cost, lack of proven benefits, lack of skilled staff, concern about loss of contact with customers, and security issues were cited as obstacles. [12]

BEYOND THE TEST CASE

The report didn't mention that getting the trust of the customer was equally important. The fact was some attempts at e-commerce had resulted in retailers being unprepared or unable to fill orders or make timely delivery which had been a big turn-off, particularly for New Zealanders who had been shopping offshore. A growing number of local shopping sites had populated the Web during 2000. Some were simply billboards, attracting foot traffic to the real-world counters. This was rapidly changing as more companies deployed smart new tools, affordable transaction processing and e-commerce software.

On-line outlets were also discovering how important it was to be 'sticky' or devise ways to keep the customer coming back through providing interesting content, attractive offers, and services. The most successful sites seemed to be those leveraging existing bricks-and-mortar operations, rather than unknown, Web-only newcomers. Everything from liquor to lingerie, fashion, food, books, music, and beauty products could now be bought on-line locally and delivered direct to your home. ISP Ihug opened its own Ihug Superstore with over 10,000 products. It abandoned its physical PC store where it sold Ihug-branded PCs in 2000 and took everything on-line, allowing customers to configure PCs on the net and drive in to pick them up. On-line grocery shopping was also taking hold. After testing the market for several years, Woolworths was taking thousands of on-line orders each week and turning over millions of dollars.

In September 2000, 15 e-tailers, including Dick Smith, Flying Pig, Sounds, Modern Bags, and Stirling Sports, signed up for New Zealand's first Internet shopping scheme. The scheme used prepaid cards of different denominations, which when scratched revealed a security number that could be used to register and pay for goods on-line. On-line banking services were operated by BNZ, ASB, Countrywide, and BankDirect, with a number of real-time payment approaches set to encourage more customers on-line.

IDC Research suggested the number of New Zealand-Internet users was reaching critical mass, making it more viable for retailers to have an on-line presence. It predicted Kiwis would spend $540.1 million over the Internet in 2000 rising to about $5.4 billion by the end of 2004. A September 2000 AC Nielsen survey showed 23 percent of Kiwis used the Web to browse for products, ranking

second in the survey with Australia and Norway. The keenest on-line shoppers were the Danes, with 31 percent of users browsing for product information. On-line purchasing was more likely to happen in Australia and New Zealand than in Singapore. New Zealanders were also likely to have more than one access point for the Internet, with many homes now on their second or third PC.

Web-research company Red Sheriff found that by late 2000, 27 percent of New Zealand Internet users had shopped on-line, and predicted that this would reach 53 percent by 2002. It also predicted on-line banking would double from 24 percent to 55 percent, on-line airline reservations would more than triple from 13 percent to 40 percent, personal investing on-line would grow from 9 percent to 20 percent, and there would be a 13 percent increase in on-line job seekers.

Despite economic indicators showing business confidence declining almost as fast as the New Zealand dollar, those involved in e-business appeared to be bucking the trend.

An Electronic Business Association (eBanz) survey showed barriers to e-commerce were being removed, and new products to help businesses operate on-line were finally becoming available. The survey found 68 percent of Kiwi businesses believed e-commerce was critical to their future and most were planning to make major on-line investment over the next five years. However the majority surveyed believed their current investment in e-commerce was significantly behind overseas competitors and feared losing greater ground unless speedy efforts was made to catch up.

Half the firms spoken to expected increased revenues through their investment in e-commerce while about 18 percent were confident of increased export revenues. They knew they could not ignore e-commerce if they wanted to remain competitive. One estimate suggested around 50,000 small and medium-sized businesses had a dedicated Web presence; however, only around 5 percent of those offered on-line transactions.

Rumours that New Zealand was not up with the play in the e-commerce game were put to rest by another report that insisted we were underestimating ourselves and were in fact among the top five e-ready nations. The 'State of e-New Zealand' report from Victoria University's Institute for the Study of Competition and Regulation (ISCR) in 2000 claimed New Zealand was ahead of Australia and right up there with the United Sates and Canada. The main reason we were a shining example, said the report, was that we had a unique centralised banking system, a network handling banking transactions, and a single Eftpos system that all banks could use. This had helped position New Zealand as world-leading users of ATMs and Eftpos and confident adopters of new technology. Our relatively low telecommunications costs and the Kiwi Share, which ensured free local calling for all households, were also seen as critical factors in our readiness to adopt the Internet and e-commerce. Our Internet access was cheaper than Australia's, and according to some measurements, cheaper than even the United States. We also had more servers hosting Internet pages per head of population than Australia, and that number was growing faster than anywhere else in the world.[13]

CARRIERS SEIZE THE DAY

The country's top Internet service providers were also facing off around their Web-hosting capabilities and e-commerce tools. Xtra had been split in early 1999 with key business initiatives and talent going into a separate organisation. The eSolutions business was a partnership between Telecom, EDS, and Microsoft. Xtra's Business Builder Package, with all the tools needed for a business to design, build and manage an on-line store with inventory control, billing, communications, and marketing systems had been transferred to eSolutions.

By mid-1999 Xtra had 200,000 customers, with an average of 1000 signing up weekly. By the end of 2000 it had well over 300,000 subscribers and captured about 42 percent of the overall

market. Its web site expanded to become a portal with community interest areas, a shopping mall, news, sports, weather, children's and teen content with a jump off to Telecom's 18 telephone books on-line. Xtra's Shopping Central had around 100 shops selling everything from jewellery to flowers, music, toys, electronics, and marine products. It was investigating overseas trends in mobile access including (WAP), short messaging service (SMS) and broadband enhancements to see how these might apply to New Zealand.[14]

By the end of 2000 Xtra had relaunched its XtraHost Web-hosting service, offering 20Mb of disk space and a range of Web-development tools and templates including low-end Web-hosting options for small to medium businesses. The packages were bundled with domain name registration, hosting, adverts in the Yellow Pages, an 0800 free calling number, virus protection, and security. Fees ranged from $80 to $250 a month and beyond. Telecom partner eSolutions[15] had low-end transaction processing that could be added to a web site. Xtra general manager Graham Mitchell said there was strong growth in the number of retail businesses getting on-line. "These are busy people, who want to stay up to date with technology but don't have hours to research what's out there." Xtra had also begun to power up its content delivery capabilities in partnership with Akamai Technologies. Akamai servers were deployed within Xtra's network, ensuring faster download and delivery of rich content including graphics, banner ads, applets, and streaming media.[16]

Clear Communications was undergoing a major consolidation, shifting focus from a residential and tolls-based company to an e-commerce provider. Restructuring began in August 1999 with the loss of more than 150 jobs and an injection of $170 million from new owner British Telecom to 'retire' the company's growing debt. It reported a $30 million loss for the year ended March 2000 but claimed its e-business services had brought strong growth. Revenues from Clear's Internet services grew by 60 percent year-on-year, while local service line numbers had increased by 120 percent. By the end of 2000 its business markets accounted for 76 percent of revenues; 60 percent of that from on- line and Internet activities.[17]

As the market evolved Clear delivered increasingly competitive offerings to entice more small businesses onto the Web – including new personal and professional Web-hosting packages. The Clear PaySafe service turned web sites into credit card terminals. There were no charges unless the site processed more than 50 transactions a month. Clear's bundles included marketing for customer sites which promised to keep them in the top 20 search engine results of the main search engines. "Building a web site is one thing; getting anyone to see it is quite another," said Altatude partner Phillip Head. Research showed that more than 85 percent of all Web user sessions started with a search engine and users rarely went past the first 30 search results. In fact the top 30 results received more than 90 percent of search traffic.[18]

STILL IN DAMAGE CONTROL

A good 18 months after the dotcom crash, companies were still in damage control, lowering their expectations, and cutting back on investment and costs. The optimists had insisted the worst was over and recovery was in sight, but they were wrong. The winds of change were still blowing hard. ISPs, content providers, telcos, consultants, and e-commerce providers in the business-to-customer and B2B sectors were still cowering. Telecommunications companies were shedding; between them Alcatel, Lucent, Siemens AG, Marconi, Nokia, and Nortel dumped 48,000 staff. Cisco dropped 8000. And the wider computer industry was still reeling from the shock waves as hardware, software, systems providers, and desktop PC companies pulled back on projections and production and dumped staff. Spending had slowed, the advertising market was at a ten-year low, investors and banks had the jitters and the pruning sheers were still out. In the United States more than 100,000

people lost their jobs by mid-year 2001 – 80 percent up on 2000. In June, 53 dotcom firms folded up compared to 17 the year before, bringing total failures over 18 months to 555.

The only good news seemed reserved for cautious clicks-and-mortar operators who resisted the hype, and the vulture capitalists who were in a fire sale feeding frenzy. According to San Francisco–based Webmergers.com, in the first half of 2001, US$29 billion was spent on mergers and acquisition involving 726 US companies.

The dotcom domino effect was not happening because consumers or businesses had given up on the Web – more people were logging on than ever. The root of the problem according to Federal Reserve chairman Alan Greenspan was 'irrational exuberance' – a get-rich-quick mentality that suggested the old rules didn't apply to the new Internet economy. Changes over the next five years would force companies to make more consistent use of resources, including staff, through outsourcing and sharing with partners and suppliers. Web-centric business models using a new wave of Internet applications would help put the focus back on creating revenue, he said.[19]

The entire information economy was in still spasm. Those tired shell companies that boosted the Nasdaq only to bomb when shareholders demanded substance, and the endless round of upgrades, add-ons, and constant coding required to enter e-topia had taken their toll. The information economy was in shake-down mode and anything that could be shaken would be. It was time to consolidate, revisit business strategies, get tight within organisations, decide who your friends were, and watch your enemies. The optimists were now scheduling economic recovery for mid-2002.

Generally the survivors would be those who were doing good business before the Internet came along, who had the right product, the right marketing and promotional approach, and distribution systems that delivered goods or information on time.

Obviously the Internet was now a pivotal medium for business but there were clear indications we could make better use of it. According to Domainz, the organisation that administered Internet name registrations in New Zealand, we were the fifth-heaviest users, by head of population. There had been tremendous growth in by private companies. In 1993 the dot.co.dot.nz domains accounted for around 9 percent of the total. At the end of 2001 they made up 86 percent of New Zealand's Internet presence, said Domainz boss Derek Locke. In the last quarter, however, there had been a levelling out of new domain registrations. "We were getting around 5000 new registrations a month, but with a drop-off of around 2500 a month things were slowing to a trickle." Locke said New Zealand had 101,240 'live' domains, but around two-thirds were used primarily as email addresses to reflect the user's location. In other words New Zealand had fewer than 40,000 active web sites competing in the new world of global e-commerce.[20]

DOT.CO DOT.NZ DROPOUTS

The dot co.nz and dotcom dropouts had forced New Zealand electronic marketplaces and portal operators to review their own web sites, on-line business models, in-house technology, and what customers really wanted. While e-commerce collectivism – multiple suppliers buying and selling from neutral web sites – appeared the next big thing, there was mounting evidence of the need to get back to business basics. The first step in achieving value for investment was to get beyond all the corporate portal-B2B exchange-e-procurement-marketplace-trading post hype, which was full of overlap. The fact was the technology wasn't as simple or open as promised, and practical incentives for companies to shift to bulk buying from aggregated web sites had been lacking. The trend in this direction had taken hold in the United States three years previously and been overtaken by the growth of specialist software providers. New Zealand had been in copycat mode and now faced the consequences.[21]

E-tailer Flying Pig had made its debut with a loud fanfare. Now it provoked all manner of humour: 'What's pink and smells like breakfast if it flies too close to the sun? Frying pig.' The electronic retail portal selling on-line books, stationary, and music was launched in late 1999 and touted as New Zealand's answer to Amazon.com, but ended up gobbling the funding before it could turn a profit. The unfortunately named company was backed by retailers that high-flying entrepreneur Eric Watson owned or had shares in, including Whitcoulls and Pacific Retail, which owned or had shareholdings in Noel Leeming, Bond & Bond, and Computer City chains. New owner Blue Star Group pumped a further $2.5 million into the company. In November 2000 Advantage Group, which owned 24.55 percent of Orion Ventures, owner of Flying Pig, sold its shares to the on-line division of IT Media, a company that published magazines and Internet content. Company founder Stefan Preston admitted Pacific Retail, which owned 39 percent of Flying Pig, had lost more than $1 million in the e-venture.[22]

The closure of Flying Pig and e-marketplace site Onezone put the jitters into the local market, forcing many suppliers, and those aggregating sites into virtual trading posts to rethink their direction. Flying Pig failed to consolidate after several ownership changes and problems with its original technology. Despite cutting staff and reducing overheads, profitability proved elusive, and after reneging on debt it was shut down. Auckland company Biolab Scientific also learned the hard way after it launched its Onezone e-marketplace in early 2001. Eight months later it was dead in the water after bleeding several million dollars. The site had 22 suppliers selling scientific equipment, office equipment, computers, and liquor but only eight large customers, who didn't put through enough transactions at a 2.5 percent fee to pay the bills. Onezone, which used Ariba's marketplace software, blamed client companies for failing to champion the transition.

Locally a number of marketplace survivors and technology providers were pushing for new business. SupplyNet client SME Connections had 500 customers using Commerce One's MarketSite software, supplying a catalogue of services promising savings on fuel, telecommunications, recruitment, printing, couriers, stationery, and beverages. Another early developer was e://volution, which had invested more than a million dollars pulling its site together using IBM's Websphere package, servicing more than 70 buyers and sellers. A handful of industry-specific portals had also found their niche in the forestry, agriculture, hospitality, fisheries, and garden supplies industries. There was a desperate need for more success stories to instil confidence about how exchanges, e-procurement, corporate portals, and e-marketplaces fitted into the supply chain. Once you got past the terminology and the sales talk, it was after all about extending the borders of your business and removing obstacles to transparent e-commerce.[23]

There were now a multitude of middleware and other solutions to get systems talking to each other, which helped shift the focus to smaller companies. SAP, PeopleSoft, Baan, Oracle, JD Edwards, Great Plains, and others had not only embraced e-commerce, they had scaled down their systems to desktop level and even had options for the 86 percent of New Zealand businesses that employed around five people. At last banks were providing multi-currency transaction capabilities, and the legal framework to ensure retail and consumer protection was on its way. The Electronic Transactions Bill was expected to expand the existing legal framework to embrace electronic documents and signatures and concepts familiar to the on-line world. No longer would you have to print out everything and keep it in hard copy in a filing cabinet for it to be considered legal.

While it had taken four years of industry pleading, the BNZ had finally reworked its internal systems and added the ability to accept credit card transactions in 12 foreign currencies to its stable of on-line offerings. The bank was now leading the charge with its Currency Select package and the other major trading banks followed suit. The trend begun by WorldPay was a boon to exporters as it finally allowed offshore customers to pay in their own currency and have it converted directly into New Zealand dollars.[24]

E-STRATEGY SHOWS PROGRESS

In November 2001 Information Technology Minister Paul Swain delivered his progress report one year on from the government's e-Commerce Strategy announcement. The Strategy had identified 60 actions and commitments for attention by government in partnership with the private sector. He said e-commerce, which was about business doing business in a networked electronic environment, was critical for the development of the New Zealand economy, in that it put New Zealand business on the front doorstep of the world. It was an important part of the push for the knowledge economy. Research now showed 61 percent of local businesses had a web site, up from 33 percent in 2000.

Swain said eCommerce Action Team (eCAT) and the regional events being staged around the country to raise awareness of the government's vision had resulted in each sector developing quarterly action plans. The team was involved in identifying ways of meeting specific sector needs. "A number of regions have shown admirable leadership in promoting e-commerce initiatives and in formulating plans to enable high-speed Internet access."

eCAT's web site was being used to help the wider community build e-commerce capability and develop support networks. It contained an e-commerce guide, case studies, research, and statistics, links to members' pages, news, and a calendar of related events. It had a mailing list of more than 750 subscribers. Industry New Zealand through the BIZ programme had developed an eight-module e-commerce training programme aimed at SMEs. There was a close liaison with the e-government strategy outlined in April 2001, and an alignment with the mission that by 2004 the Internet would be the dominant means of enabling ready access to government information, services, and processes.[25]

According to a *NZ Herald* report in May 2002, New Zealand businesses were flocking to the Internet.

Figures from an Internet survey commissioned by the Ministry of Economic Development were revealed at an e-commerce forum in Wellington. Waikato University professor of management communications Shirley Leitch said that in the 21 months since the last ministry survey the use of the Internet by businesses had risen sharply.

Of the firms surveyed with six or more staff, 56 percent had their own web site and 91 percent used email. Three-quarters of firms with more than 50 full-time staff now had their own web site and 95 percent had a domain name, according to the survey. "There are clear signs that e-commerce is becoming bedded in – it's no longer just emails," Leitch said.

The number of firms using e-commerce "often" or to the "maximum extent possible" had risen substantially. Unsurprisingly, the survey showed almost all firms used their sites to advertise. But only 11 percent of web sites could take payments on-line. Thirty-seven percent could take orders and about 20 percent allowed some form of secure transaction.[26]

In June 2003 Paul Swain released the final eCAT report, claiming it had been a successful example of government and business working together to improve conditions for the economy as a whole. The team of industry and business leaders and experienced e-commerce individuals, set up in March 2001, had 'greatly assisted the government in achieving its vision for New Zealand to be world class in embracing e-commerce for competitive advantage.'

Swain said highlights included ten regional e-commerce events, the development of the www.nzecommerce.co.nz web site, a freephone service to help businesses increase their e-commerce involvement; the development of sector-specific action plans, specialised research projects, and the e-commerce guide for small business. The team had worked with the MED as it commissioned

work on e-commerce uptake and co-operated with the Inland Revenue Department and Waikato University on surveys and research projects. It had brought together government departments to develop the business case for a comprehensive statistics regime for the ICT sector of the economy, rather than just the e-commerce element.

The team had supported the development of the Regional Broadband Forum as an effective way of supporting improved high-speed networks throughout the country, bringing people together to work on broadband initiatives, and discuss areas for co-operation. Much of its work was taken over by the regional consultation process for Project PROBE, an initiative developed jointly by the Ministries of Education and Economic Development to roll out broadband to all schools and provincial communities. It was also involved with efforts to establish a next generation high-speed Internet network, connecting universities, and research institutions.

The National Broadband Applications Project, organised by TUANZ and supported by eCAT, brought together more than 200 people to come up with ways to turn broadband to economic and social advantage. The event was held in Nelson in November 2002. "It is clear that the importance of e-commerce is now well understood, and eCAT can take much of the credit for this. The government is still doing a lot of work in the e-commerce and ICT area, and the momentum is being continued through the Small Business Advisory Group and government agencies," Swain concluded.[27]

The announcement that the Electronic Transactions Act 2002 had passed into law on 10 October 2002 was a major step the business community had been waiting for, since it became apparent that existing law didn't technically recognise on-line transactions or the movement of currency between bank accounts. The legislation had arisen from a lengthy consultation and development process that began in 1998 with the issue of a Law Commission report on e-commerce. Further reports followed in 1999 and 2000 plus a discussion paper published by the MED in 2000. "This Act, which puts electronic transactions on the same legal footing as paper-based transactions, will allow the thousands of statutory legal requirements for writing, signature and retention and production of documents to be met using electronic methods," said Paul Swain.

"The Act will help reduce business compliance costs by allowing the use of electronic transactions and the electronic storage of information instead of paper-based processes. It will also make possible a whole new level of e-government, enabling electronic methods to eventually become the dominant means of interacting with government. As such the Act is a key part of the government's e-commerce and e-government strategies. It also contributes to the Growth and Innovation Framework by allowing for increased local demand for information and communications technologies."

The legislation was based on the Model Law on Electronic Commerce issued by the United Nations Commission on International Trade Law (UNCITRAL), and closely followed the Australian Electronic Transactions Act, thereby minimising transactions costs for exporters.

"The 'world-class piece of legislation' would substantially enhance New Zealand's international reputation as a leading country in electronic commerce and e-government," said Swain. But there was a catch. The Electronic Transactions Act 2002 was delayed by the need to pass regulations to clarify grey areas on how the act should affect other legislation. Outstanding issues included the effect on tax record requirements, credit contract notice requirements, and notices about the destruction of dogs.[28] A discussion paper was released on 11 April 2003 and submissions on the proposed regulations closed on 1 May 2003. The Act finally came into force on 21 November 2003.[29]

SURFING MATURES

In 2003 it was clear New Zealanders were rapidly waking up to the fact that haphazard browsing was a major waste of time. They were becoming more discerning about the sites they visited and

bookmarking those that found useful and reliable. They wanted functional services that made life easier including on-line bill payment and airline reservations. Government pages, including local authorities, banking, and the top search engines Google and Yahoo! rated consistently in the top ten visited in any month during 2003.

Hitwise said New Zealanders were becoming more confident with on-line transactions, resulting in 40 percent growth in visits to sites in the on-line shopping and classifieds category. The most popular items purchased on-line in 2003 were electronics, music, hardware and software, and books. However banking dominated, overtaking on-line shopping as the most frequently used service. According to an independent survey, more than half of regular Internet users were banking on-line at least once a week, and more than 100,000 were daily users. Most were viewing account balances, recent transactions, transferring funds between accounts or paying bills.[30]

More than 70 percent of us regularly connected either at home, work, on PDAs, or from public locations such as Internet cafes. This meant family and friends could keep in touch with very little effort regardless of where they were around the country or the globe. Local Internet use was finally giving credence to the concept of a global village, and in the workplace had enabled a new generation of remote users and teleworkers.

InternetNZ estimated there were about 150 ISPs in New Zealand by the end of 2003, but the 50 or so medium to large providers had about 70 percent of the customers, with Telecom making up just under 50 percent of the total business. The remaining 100 or so ISPs were mainly regional or served special-interest groups. In the process of discovering the Internet our habits had changed – for young people email and Web access was increasingly seen as essential for social communications finding out what was on and buying things like CDs.

According to Tessa Court, senior vice president of global sales and marketing for Hitwise, traffic to local web sites was up 6 percent on 2002, with 29 percent of all visits now directed at local sites. The average time spent on-line was about eight minutes. Based on two years of data, Kiwi surfers were strongly influenced by world events and mainstream media. There was a growing interest in central and local government and city council web sites, which were using the Internet to increase community awareness, to tap into initiatives, and market themselves – much like private businesses. During September 2003 the most popular web sites were Hotmail, Xtra MSN, Google NZ, ICQ, and Yahoo! suggesting the main reason for surfing was to communicate, use portals, and navigate the Web. News-related web sites such as the NZ Herald, INL's Stuff, and TVNZ's nzoom also ranked highly.[31]

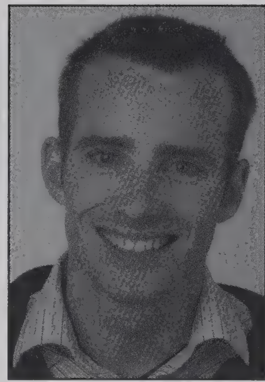
THE TRADEME BREAKTHROUGH

One of New Zealand's great e-commerce start-up success stories, TradeMe launched in March 1999 as a classified auction site like e-Bay, but initially specialising in computer parts and systems. It experienced month-on-month growth and quickly branched out to cater to a thriving antiques market. Soon cellphones and clothing had become popular items.

The site felt alive, as though something was happening all the time. It could tell you how many items were listed in each category and it was clear the clock was ticking on items for sale as each new bidder upped the ante. The red flag went up when the reserve price was reached and soon there was a critical mass of users, making life interesting for buyers and sellers alike. "If buyers can't find what they need this month the chances are it'll be there next month so they keep coming back. There are also more sellers each month and they come back with more items," said TradeMe general manager Nigel Stanford. In July 2002 there were an average of 176,000 visitors and about 90,000 of those were regulars. "On any day we're averaging about 1200 people selling up to 7000 new items

with probably 2–3000 people bidding." More than $15 million worth of goods had been sold to date.

TradeMe was a veritable portal, using its technology to host the SafeTrader escrow service, a trusted third party releasing money from larger sales to the seller of goods once the auction process was complete. It also hosted its own Flathunt flatmates site, putting those seeking accommodation in touch with suitable places. And there was the Old Friends school reunion site and the Find Someone dating site, in which the company had a major shareholding. The TradeMe network allowed the company to cross-sell through its various sites. That also worked with TradeMe stores. The auction technology, originally designed by company founder Sam Morgan and run from his lounge, was now continually being upgraded by a team of developers, with new uses being discovered every month. The homegrown technology was also finding a niche as portal partners and niche users repurposed it for their own use.



Sam Morgan, founder of New Zealand's most successful e-commerce business TradeMe.

Originally the company didn't charge users for goods sold at auction, but in September 2000 it decided to opt for a percentage of each sale, and it didn't look back. Typically it charged less than 5 percent of the sale price.[32] TradeMe had cruised into profit after two and a half years, and by October 2004 was rated as New Zealand's most visited shopping site. In July that year it had 952,244 unique visitors with 250 million page views or around 30–40 percent of all traffic on the co.nz domain. Mark Ottaway, managing director of Nielsen//NetRatings, described TradeMe as 'phenomenal' in terms of the traffic it attracted. "It is far and away New Zealand's most successful on-line site. It's a good Kiwi success story."

Based on its poll of 3750 New Zealanders surveyed in the first quarter of 2004, 7.9 percent had shopped at local on-line sites and 5.9 percent at overseas on-line sites. While the numbers were modest, 22.6 percent used the Internet to research information on-line, and 19 percent had bought something on-line in the preceding 12 months. The most popular purchases were travel, books and magazines, entertainment, and movie tickets. Small numbers purchased computer software and music.[33]

A Massey University study of Internet buying patterns and attitudes in late 2004 said convenience and saving time were the strongest motivators followed by competitive prices, the wide selection of goods and regularly updated information. Typical on-line buyers were aged between 21 and 39 and well educated. Those who didn't finish secondary school accounted for only 6.9 percent of on-line shoppers. The biggest impediment to buying was web site security and privacy, and the study warned e-tailers to adopt advanced encryption technology and post assurances of security on their web site. web site design, reliability and customer service also influenced consumers

Growth in e-commerce was now rapid, with the popularity of sites such as eBay in the United States and its local equivalent TradeMe helping boost consumer confidence. Many computer companies now allowed customers to experiment with different configurations and costs on-line before committing. And there was a lot of activity in the on-line consumables market with sales of toner, ink cartridges, CDs, DVDs, removable media, printers, faxes, and phones. The new confidence among Kiwis was confirmed by Visa, which said the number of on-line transactions made by its card holders had jumped 95 percent in 2004. On-line shoppers racked up $400 million in sales on their Visa cards, with anecdotal evidence showing the trend was mirrored by other credit card vendors. And much of the spending was local, with cross-border transactions accounting for 16 percent of all Visa's e-commerce transactions, up slightly from 15.2 percent in 2003.

Richard Shearer, the general manager of WebFarm.

With everyone from Air New Zealand to Woolworths now accepting credit cards through their web sites, on-line payments was becoming an attractive option to pay bills for everyday items. On-line transactions averaged a hefty $141 each. Groceries, electronics, and larger consumer goods were popular purchases. Visa's general manager for Australia and New Zealand, Bruce Mansfield, said on-line authentication of credit card transactions had eliminated 'virtually all' fraud-related charge-backs. "A secure foundation coupled with increased demand for specialised products not offered in local markets continues to drive cross-border transaction volume." Businesses as well as consumers were increasing their e-commerce activity. Visa's global e-commerce sales volume originating from more than 90 countries was estimated to exceed $210 billion in 2004, 57 percent higher than in 2003.

Richard Shearer, general manager of WebFarm, which enables companies to sell goods internationally in any currency, said some businesses using the service increased sales by 200 percent in the run-up to Christmas 2004 compared with 2003. "These trends indicate that businesses who implement e-commerce as a cost-effective sales channel are growing their business and facilitating export sales." "On-line travel purchases such as for airline tickets and accommodation had made on-line shopping a realistic everyday alternative," said Shearer. And the dramatic increase in on-line business was customer led rather than business driven.[34]

By the end of 2005 it was estimated 84 percent of New Zealanders who regularly use the Internet were conducting on-line research ahead of making a purchase and at least 30 percent were purchasing on-line, according to Nielsen//NetRatings. Other market research used by Telecom suggested 309,000 people in New Zealand regularly shopped on-line. Local and international research looking at on-line buying habits confirmed books, music, videos, and travel were the most frequently purchased items followed by flowers, gifts, food, drink, electric appliances, computers, toys and games, apparel, and accessories.

Books topped the list mainly because consumers felt no need to inspect them closely before buying. New Zealand led the world for on-line banking (49 percent). Now it was clear our use of the Internet for information on travel, including destinations, accommodation, and planning itineraries was among the fastest growing. About 40 percent of us had made reservations or purchased tickets on the Web. Around 50 percent of Air New Zealand customers traveling within New Zealand or on trans-Tasman and Pacific routes had booked directly.[35]

14

Battle of the names

Taming of the domains

> It was an environment no one had found themselves in before and he was the one who copped all the flak. We had domain name hijackers and people registering thousands of new names and he was trying to put in place a structure to cope … I went with him to see various people but some of them were unbelievably rude and offensive. He just had to hunker down underneath all of that.
> Jim Higgins ISOCNZ chairman defending embattled Domainz executive Patrick O'Brien.

With thousands of businesses around the globe dependent on always-on, high-capacity, on-demand Internet services, the question was being asked, could the Internet continue to grow exponentially without technical tweaking, upgrades, maintenance, more robust administrative and legal frameworks?

When the technology that enabled the interconnection of computer networks within the US military and academic communities went global, the 'public good' backbone soon became commercial strength, and ownership shifted to consortiums of telephone companies, responsible to shareholders to turn a profit.

There were more questions than answers. Could it still be said that the Internet belonged to everyone and no one? Could censorship, copyright, trademark issues and court suppression orders still be enforced? Could junk mailers and pornographers continue to fire their unsolicited material at our mailboxes without risk of penalty? Was it down to each government to regulate and monitor what was fair or foul, or did responsibility fall to the holder of each country code, ISPs, the individual or some eclectic mix of these stakeholders?

There was no single international forum that could be described as governing or controlling the Internet. Responsibilities were shared among numerous private sector or industry-driven groups, to avoid undue influence from vested interests including governments. There was the Internet Engineering Taskforce (IETF), which managed the protocols and technical specifics, the IAB, which had the big picture overview of how everything was strung together, and the Internet Administration Numbering Authority (IANA), which handled numbering, naming, protocol, and policy issues for the Internet.

IANA was headed by Dr Jon Postel, under contract to the US Government through the University of Southern California's Internet Standards Institute (ISI). It had a relationship with the ISOC, which provided secretarial and administrative support and edited the request for comment (RFC) – essentially achieved by consensus – which after multiple drafts and submissions typically became the bylaws of the Internet community.

While the US Government subsidised the initial expansion of the Internet, it had given notice that its input, including the administration and management of the underpinning domain infrastructure that allocated and managed country codes, was not indefinite. Future development would require a new body, and if the Internet community had its way, this would be private sector and industry led. Technology was moving rapidly and the burden had to fall somewhere; someone had to pay the bills that arose from managing and maintaining the domain name system and ensuring the Internet geared up to meet what was obviously an accelerating growth curve.

In those primordial days Waikato University not only handled all the administration for the New Zealand end of the Internet; it brokered the majority of the country's bandwidth to and from the US backbone. From 1989 it began supplying access across the university network and inevitably into the public domain, but there was uncertainty where its responsibilities began and ended. In effect it was operating from a two-sentence email sent in 1986 from IANA head Jon Postel, via CSnet International Liaison programme director Larry LandWeber. LandWeber had brokered the deal that made John Houlker at Waikato University country manager for the dot.nz space.

Early users of the Internet in New Zealand were part of a close-knit community and most technical and Internet access issues were still resolved through direct personal relationships, with the university staff administering the service. If someone requested a domain name they basically sent an email request to whoever was maintaining that domain at Waikato or Victoria University. The domain name database was administered almost as a 'public good,' courtesy service.

As the Internet became increasingly dominated by commercial interests, various university computer departments had become de facto distributors of Internet access within their own campuses and sometimes beyond. The administrative roles initially allocated to Waikato University and the Tuia Society were moved across to a new body representing the wider national interests of Internet users in 1995. At the time there were around 24 ISPs.

ISOCNZ was the perfect expression of the academic, science and technology, and private sectors working together without government involvement. ISOCNZ assumed its authority to operate the dot.nz policy from the two-line email via Postel to Waikato and took its mandate from RFC 1591.[1] This discussion document had done the rounds of the Internet community, been refined over time, then been frozen as a legal position defining the roles and function of the international Country Code Top Level Domain (ccTLD) manager. In effect this statement made it clear that a country code manager would act in the best interests of the local Internet community.

The society was based on the foundational statement that the Internet in New Zealand would remain 'uncapturable.' In other words, the not-for-profit organisation would become the kaitiaki caretaker or 'guardian' of the Internet. It was asked to find a workable balance between open and free expression, and protecting users against the threats posed by hackers, crackers, pornographers, unscrupulous ISPs, carriers that held users to ransom, and enforcement bodies who wished to impose onerous tax, copyright, and other legislative constraints.

There was a general sense of relief that a body had been established with formal rules and goals to progress things from the unwritten arrangements between Waikato University, Victoria University, and the Tuia network. However the way in which this was achieved was soon to raise some eyebrows and become the centre of heated debate.

COMMERCIAL PRESSURE POINTS

From 1996 the main carriers, Telecom and then Clear Communications, entered the fray with their own Internet operations and were fighting tooth and nail for market share, using every means to stave off competition from the now 90 or so ISPs nibbling at their heels. The main gateway at Waikato University was working closely with Telecom, Clear, and Telstra and increasingly taking a backseat in terms of bandwidth provision. Rather than depending on Waikato as their only source of access, the universities could now go to market for competitive ISP services.

Jim Higgins, the second president of the ISOCNZ.

Waikato University's Information Services Department remained intricately involved in managing the dot.nz country code, handling domain name registration and the dot.nz DNS but keen to devolve the last vestiges of its pioneering efforts to the ISOC. The DNS at Waikato, containing all the locally registered domain names, linked to a global directory of names and addresses in the United States enabling Internet users to find people or information anywhere on the Internet. It was like a phone book that translated domain names, host names and IP addresses to email or Web addresses.

Most New Zealand domain names were still managed and moderated at Waikato University by Rex Croft, considered New Zealand's 'father of DNS.' As the pressure came on, Waikato had written scripts, Web forms and an email template to do all the donkey work, including running tests to ensure name servers were reachable. If someone requested a new domain name or changes to a domain, Croft would typically copy the details into his own file and then load this into the DNS and ensure it was live.

ISOCNZ hadn't intended taking over the physical work of registering domains. Its prime concern was watching over the wider interests of the evolving Internet community. But if the requirement was there, surely it would be a relatively easy process to take over the DNS Registry and just as easy to delegate this responsibility. Just as the transition from Waikato was underway, the Internet went through an exponential surge no one was prepared for. For many months ISOCNZ was so wrapped up in sorting out its own internal identity issues, and how it would manage its new responsibilities, that it failed to communicate clearly to the Internet community what was going on.

Initially there had been no cost in obtaining an Internet domain name – that was picked up by the taxpayer – you simply sent your email request and it happened, even though you might wait a week or two. Your domain was yours indefinitely, with no requirement to re-register it year on year. That was all about to change. Waikato University wanted out. The ISOCNZ council was forced to look at what might be involved in setting up its own .nzRegistry, and the best business model to cover the cost of that project while continuing to pay Waikato for its services during the transition.

Jim Higgins had been involved from day one with ISOCNZ at committee level, and recalled asking the newly formed body[2] what its plan B was for managing the dot.nz domain. "They didn't quite understand my meaning. I said registrations were skyrocketing and one day the accountants at Waikato University were going to find out how much they were contributing to running the .nzRegistry. The representatives from Waikato assured me there was no problem but the very next ISOCNZ council meeting, gateway manager John Houlker made an announcement: 'Gentlemen, I

have some serious news. I have had a visit from the accountants and they are concerned about the cost of running the domains and don't think it's core university business.'"

The decision by ISOCNZ to begin charging for domain names was fraught with tension, expressed strongly from within the group of 500 or so existing domain name holders who had acquired their 'cyber land rights' for nothing and were now having to pay for the privilege. Don Stokes, who was looking after registrations at Victoria University, said the old school in particular baulked at the idea. The fact that someone might make money from registering domain names, something that had effectively been a labour of love for a few core individuals, did not impress. "This was seen as further evidence that nasty capitalism was now invading the once pure halls of the Internet community. I got a few calls from people saying, 'Oh, how sad you've bought into the whole user pays thing.'"

The newsgroups were running hot with terse comments and criticisms from gamers, greenies, political activists, and social commentators, unhappy with the new rules and regulations that appeared to be challenging their anarchistic idealism. Realistically though the stated goals of ISOCNZ weren't that far removed from their open access aspirations: "To maintain and extend the availability of the Internet and its associated technologies and applications in New Zealand, both as an end in itself and as means of enabling organisations, professionals and individuals to more effectively collaborate, co-operate, communicate and innovate in their respective fields of interest."

The commercialisation of the domain name space was done in a 'big bang' exercise on July 22, 1996. A fee of $96.75 including GST and administration costs stuck in the craw of Internet users who had been used to getting domain names free. They had previously had no hint of the introduction of charges; if charging had been pre-announced, people would have snapped up free domain names in the interval between announcement and implementation – domain names they may have intended to on-sell rather than use for themselves.[3]

ISOCNZ continued to rely on Waikato University's Information Services Department for technical services, database management, basic billing, and the collection of fees. Waikato had agreed to an annual contract to look after the back-end DNS servers and host the zone files for the dot. nz domain.

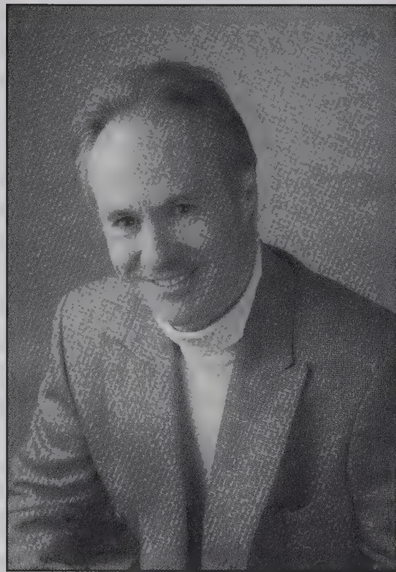
UNIVERSITIES EXIT STAGE LEFT

Waikato had drawn a line in the sand. It would continue to turn on and assign domains and receive fees on behalf of ISOCNZ for a limited time. It wasn't interested in handling any problems or disputes and began referring such issues to Andy Linton at Victoria University's Computer Sciences Department. However Linton didn't have the time or the resources to deal with them. Consequently those who were raising issues weren't getting a response to their emails and began sending even more irate ones. The abuse began to pile up and Linton threatened to resign unless the society found some other way to deal with the flood of mail.[4] "It got to the point where we had a big black cloud hanging over us," said Higgins.

On legal advice ISOCNZ had in October 1996 established a subsidiary company, The New Zealand Internet Registry Ltd (trading as Domainz), to run the domain name register. Domainz's role was to manage DNS operations and operate within the open framework policies being formulated, maintain stable operation of the name space during the transition from the universities, and establish a 'fee paying, service-based contractual framework' for delivery of the DNS. This needed to cover costs and ongoing investments in the system.

Jim Higgins was elected[5] chairman, replacing founding chairman Roger Hicks, whose term was up. Higgins priority was to get both ISCONZ and domain registration on a solid business footing. He needed someone to take charge of the domains business and phoned Bev Pratt, at Wellington's Doughty Pratt human resources company, asking how long it would take to get a chief executive. The candidate she came up with was Patrick O'Brien, a specialist in change management who had just finished a contract shutting down Telecom's Asian operation.

Within two weeks O'Brien was essentially working as business manager with the core responsibility of running a commercial registry, and migrating that business away from Waikato and Victoria universities. He was to place the New Zealand DNS on a formal footing 'in line with the development of the Internet as a critical infrastructure for the country.' However he didn't exactly walk into executive luxury with a fat pay packet. Initially he operated from a spare desk and shared a telephone line at Higgins's consultancy company, The Net Edge. To start with there was no money, not even for his wages, all the funds were tied up at Waikato University. O'Brien's first task was to establish an accounting system to take charge of this revenue stream, pay himself, and develop the business.



Patrick O'Brien, was caught in the middle as head of Domainz as he tried to enforce new business models for allocating and managing domain names in the previously anarchic Internet environment.

According to O'Brien, who considered himself an Internet outsider, the ISP landscape seemed 'warriorlike,' and split along tribal lines. "The impression formed then was that the market was fragmented, competitive, and highly stylised around individuals and their personalities. It seemed to me that only the arrival of a threat from the 'man from Mars'[6] in the form of Xtra, could draw them towards a common, if temporary, purpose."

Very little had been put in writing by Rex Croft and John Houlker at Waikato University or John Hine and others at Victoria University when they had been solely responsible for dot.nz and co-ordinating the various relationships with domain name registrants, bandwidth providers, and ISPs. Gavin Adlam from Rudd Watts and Stone had been appointed solicitor for ISOCNZ and Domainz with the role of documenting the responsibilities of the new bodies. He incorporated the companies, and wrote up rules of engagement as he learned how things had been done in the past, and how they needed to be structured in the future.

In parallel ISOCNZ had created a number of working groups and committees to establish policy governing the dot.nz domain. Its policies were all pro-registrant; its foremost obligation was to protect the rights of the person who had registered the domain name. To do this it needed accurate record keeping. It adopted an 'open' TLD, similar to the United Kingdom. If policies added value they were adopted, those that did not were removed. There were few barriers to entry compared to countries with a 'closed' TLD approach, which restricted the number of domains a name holder could have, banned brand names, and required domain holders to be citizens of the country, as was the case by Australia. You only had to meet two conditions to register a domain name in New Zealand. One was that nobody else had registered it before you and that it wasn't objectionable. Even the 'objectionable' clause was later deleted.

An early task for O'Brien was to check out all the domain names that had been registered and convert them to the new, fee-based system, which in itself proved fraught with tension. He also put in place debt-collection procedures. Under the new model, those who didn't re-register would have their domain names deleted, although in the end 74 percent were repurchased. The number of registrations was on a steep upwards curve. Domainz was soon processing 150 applications a month.[7] A second person was hired to help with the phones, and ISOCNZ began laying the groundwork to establish the computer hardware and software to run its own DNS system.

Bruce Simpson at Aardvark had been contacted by 20 or so domain name holders including pioneering ISP owner David Dix and *NZ Infotech Weekly* columnist Paul Reynolds who were 'less than impressed' with the way ISCONZ handled domain name updates. Dix, owner of KCBBS, had posted on the nz.org.isocnz newsgroup while 'normally mild-mannered Scotsman' Paul Reynolds had lashed out in his weekly *Dominion* column. Dix argued he already had a contract covering his domain names with the previous operators of the DNS and was concerned at the wording of the communication sent from ISOCNZ with a thinly veiled threat promising 'cancellation' of your domain name if you don't respond.

Reynolds complained he'd spent more than two and a half hours on-line trying to comprehend and complete the form required to confirm he still wanted his domain name. ISOCNZ was telling holders of pre-July1996 domain names that they should respond quickly to avoid having their domain names cancelled. Simpson pointed out that ISOCNZ should lead by example as its own domain had still not been updated. [8]

ASSERTING RIGHTS AND WRONGS

ISOCNZ was soon under fire for taking a hard line with domain customers, for making arbitrary decisions without consulting its membership, and for failing to communicate with the Internet community it was supposed to be representing. "Given the ready-access of the net and the ease with which a democratic voting system could be implemented, why doesn't ISOCNZ put contentious issues such as changes to the domain name policies to a member-vote instead of 'imposing' policy changes without even a draft approval phase?" railed Bruce Simpson on his Aardvark site.[9]

The appointment of O'Brien seemed to go some way to addressing the problem, but his communications were often abrupt and matter-of-fact. For example, Dean Pemberton of ProActive claimed his domain name had been deleted from the registry without his request or permission. While ISOCNZ insisted it was well within its rights to withdraw the domain, Peter Mott of private domain name service company NETregistry, slammed ISOCNZ for its response, claiming the customer deserved more than blame and referral to the 'terse and technical contents of the relevant RFC.'

Mott was also critical of ISOCNZ's lack of response to his own queries, and the failure of the organisation to react in a timely manner to requests from other members of the Internet community.[10] His ultimate peeve was that Domainz was acting as both a registry and a registrar. In fact in February 1997 he called for ISOCNZ to relinquish its role as "overall supreme commander of the New Zealand namespace in favour of a strategy that more fairly and evenly distributes the power to other operators." He proposed an approach that would effectively allow resellers to compete with each other on a level playing field to the advantage of the client. The Society began inviting submissions on the matter.[11]

O'Brien said these were 'troubling times' when the governance of the Internet was undergoing great change. Management was shifting, often with great resistance, from technical experts to a strong financial-based model. He felt he was wrenching the Internet in New Zealand from the hands of technical entrepreneurs to a service-oriented, business-driven platform that was more focused

on governance. However he admitted there were some basic marketing errors around charging for domain names and the arrival of Domainz: "Taking over the domain name business was mistakenly regarded as a straightforward and chiefly technical exercise. In reality we were trying to create a business to give service to customers, when we weren't really clear who we were serving and what we were actually giving them … There was no advanced planned of how to tell people about domain name charging, little on how to fund the company's activities, staff, premises, even computers for administration were not considered, and least of all marketing."[12]

Jim Higgins, who had employed O'Brien, and was at the time chairman of both Domainz and ISOCNZ, empathised with the position the new Domainz CEO found himself in. "His job was to make Domainz work, to put systems in place to collect money and resolve disputes. It was an environment no one had found themselves in before and he was the one who copped all the flak. We had domain name hijackers and people registering thousands of new names and he was trying to put in place a structure to cope. He was under pressure and had to do what the society asked of him. He was a business man with an objective to achieve. I went with him to see various people but some of them were unbelievably rude and offensive. He just had to hunker down underneath all of that." By 1997, according to McNair, there were 516,000 New Zealanders on the Internet.[13]

FUMBLING WITH FORST

The Foundation for Research Science and Technology (FORST) was put through the hoops when it tried to get a domain name approved for its new web site. In January 1998 it sought approval for the moderated domain name www.technz.govt.nz but was told by Domainz that names with dot.govt must first be approved by the SSC.

As FORST was a government organisation, obliged to use the name Technology New Zealand, it was thought there would be no difficulty, particularly as technz@forst.govt.nz was already its email address. After three weeks of deliberating, SSC determined it 'was not appropriate … too generic' and refused permission, instead recommending more obscure alternatives.

Frustrated with the three-week delay Technology New Zealand opted for private sector naming conventions registering technz.co.nz, which was approved in a single day. That meant the new web site providing a comprehensive resource to the scientific and technology community could go ahead, albeit a month later than planned.[14]

SO WHO PUT YOU IN CHARGE?

From the outset O'Brien found about a third of his time was taken up with legal issues, including weekly meetings with lawyers. There was the Cadbury-Sanyo-Xerox domain name dispute in 1996 and later hijacking cases involving Steinlager and L.V. Martin. There were legal disputes when ISPs registered client domains in their own name, and domain name ownership issues arising after marital or company breakdowns.

Complaints to the Commerce Commission in the first quarter of 1997 alleged Domainz was involved in 'monopoly abuse and overcharging.' This followed the decision to deregister domain name holders who refused to pay the new re-registration fee. The commission also looked into

Domainz ability to take this action, given that the dot.nz domain space was a technical monopoly and ISOCNZ held exclusive franchise. By June the Commission cleared ISOCNZ of any breaches of the Commerce Act.[15]

Even the privacy commissioner looked into the affairs of Domainz, questioning its use of personal data, through its policy of making the identity of domain name holders public through its web site. It took more than a year for the commissioner to investigate and report that there was nothing irregular about the policy.[16] "When Jim invited me into the job, I thought it was to actually build a registry business – now I realise my job is to keep ISOCNZ councillors out of jail. Generally you're trying to make sure there's no exposure for the society and protect the domain name holder," said Patrick O'Brien.[17]

The criticism kept coming, much of it directed at O'Brien personally. He got a chance to set things straight when he was interviewed by journalist Russell Brown at the conclusion of the TUANZ conference in 1997.

The philosophy for us has been, we know there's a whole bunch of problems. Let's sort them out and work out where we want to be and go down that route, and eventually people will talk about our achievements. We're not going to tell them what we're doing … Now people are starting to recognise what we do with our systems. Australia hasn't done this and neither has the UK. We're going full e-commerce in about a year's time. Our Waikato-Victoria systems as they were then, governed by four individuals, could not have coped with what we're doing today and certainly wouldn't have placed us well for the future. The view was, let's get the business going and let other people argue about it … That's really what ISOCNZ is about, getting a professional stamp on the Internet. Making sure the fabric is going in the right way so that businesses can come in their droves if they choose.[18]

Domainz was soon generating a healthy revenue stream. It had reduced its debts from late-paying customers to 20 percent and improved its internal accounting and DNS management, although it was still looking into the parameters for a new management system. Rather than having to deal directly with Domainz, individuals or companies could now register their domain names through ISPs, Web designers, and specialist domain name providers who in turn dealt with the wholly-owned ISOCNZ subsidiary.

RELEASING THE DOMAINS

Registrations for names in the New Zealand country code – all the names ending in dot.nz – went through an escalating growth spiral from around 500 in the mid-1990s to 300,000 by September 2007.

A domain name or Web address could contain up to 63 characters and be obtained by anyone prepared to pay the initial and subsequent annual fees. A domain name translates to an IP address that in turn points to a web site home page or pages and associated email addresses.

Internationally the domain name structure operates on several levels: generic top level domains (gTLDs), for example, dot.com, dot.org, and dot.edu; and ccTLDs including dot.nz, dot.au for Australia or dot.jp for Japan. There is a single registry for each TLD, and the manager of each registry is recorded in the IANA database in California (from 2000 this was transferred to ICANN), operated under contract to the US Government.

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From 1986 domain names had been issued through Waikato or Victoria University with the country code manager listed as John Houlker at Waikato. ISOCNZ gradually took over from 1995 with wholly owned subsidiary Domainz looking after that function until it was sold in 2003. The Society now operates an open and competitive shared registry system (SRS).

New Zealand was the first country to introduce a first come, first served approach to issuing domain names, but this led to some serious debate about what should and shouldn't be moderated. Second-level domains including dot.gen.nz and dot.co.nz were opened and for a time there was discussion over which domain names should be moderated. For example, dot.ac, typically reserved for approved academic institutions, was being sought by polytechs and semi-private universities and even America's Cup organisations. The debate has been propelled along on Usenet after one enterprising individual, Simon Green, applied for and was granted proz.ac.nz.[19] In the end a decision was made to reserve .ac for tertiary and educational organisations. The Palmerston North Flying School wanted to have a dot.school domain, but that was reserved for primary-, secondary-, and pre-schools.

In 1998 ISOCNZ established a set of guiding principles for moderated second level domain names. Central to those principles was the notion of 'communities of interest' with the minimum ambiguity, requiring proof you were in fact a member of that community; for example dot.ac for academic should have long-term relevance to tertiary education. Membership of a second level domain would be moderated by that community of interest. Initial moderated names were dot.cri, dot.govt, dot.iwi, and dot.mil.

ISOCNZ committee member Don Stokes, involved in domain registration at Victoria University, had pushed through the dot.iwi designation at the suggestion of the Ngai Tahu tribe, after discussions with the Tuia Society technical working group and his mother, Professor Evelyn Stokes, a member of the Waitangi Tribunal. When Jim Higgins asked about his moderation policy for dot.iwi, he replied, "Well, I talk it through with my mother." After trying to find a moderator since 1996, the Society wrote to the Minister of Maori Affairs in April 1999 stating the current arrangement was clearly inappropriate and unless he could find a moderator the society would no longer take registrations. Te Puni Kokiri, the Ministry of Maori Development, was quickly appointed to the role.[20]

There had been considerable pressure from intellectual property interests not to adopt the first come, first served approach across unmoderated or 'open' domain names. Peter Dengate Thrush, retained by ISOCNZ and Domainz as honorary legal counsel from 1995, said this conflicted with the priorities of getting people onto the Internet quickly and allowing email access. "They wanted a checking process against company names and trademark databases so anything the same or similar was not registered. Part of the problem was that the Trademark Office was over a year behind in its processing, and that was only for a first examination report. We were processing thousands of domain names a week and there was

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no way we wanted to go through their process."

Besides, the trademarks process allowed for multiple use of the same name, whereas there could be only one domain. Nor was it clear that registration of a trademark was a proper basis for claiming a right to an identical domain name. "We saw no problem with someone having an email address that said jon@nike unless he was selling shoes. We didn't make any distinction as to whether 'united' was an airline, a fish shop or a travel agency, but the intellectual property people were telling us we had it all wrong," said Dengate Thrush. "We said we would let the courts sort this out on a case-by-case basis."

Another obstacle was dealt with in 1998 when Councillor Liz Dengate Thrush led a group that had the 'offensive names' policy removed. That policy would have meant continually policing the 'seven deadly words,"'introduced during the Waikato days, which aligned with the American Broadcasting System banned words list. "This was an important part of liberalising the domain policy and probably why we had such success in the growth of the registry. If we had adopted a pre-checking process for trademarks and offensive words. It would have required human intervention to vet each name, slowed everything down and prevented any automated process."

In Australia and the United States someone still has to eyeball all the applications. "At the time David Farrar and I were regularly being phoned by radio and TV wanting to record us saying the offensive words that had been on the list. David developed a way to do this in about point three of a second, and will still do this after a couple of glasses of wine." Someone almost immediately registered a couple of the more offensive words as domain names but it's not believed any were actually used as web site addresses. "It was a three-day wonder, and there was a certain amount of fourth form excitement," said Dengate Thrush.

In 1993 about 38 percent of New Zealand domains were in the dot.co.nz (company) second level domain. By mid-1999 that had risen to 88 percent. Almost two thirds of domains were linked to a web site, with just under a third using them only for email. Domainz was registering about 1200 names a month, bringing the total to about 25,000, up from about 400 new registrations per month in July 1996.[21] By October 2000 there were 75,500 dot.nz domain names and by May 2001 they had clicked past the 100,000 mark.

In August 2002, once the new SRS had bedded in, the Office of Domain Name Commissioner (DNC) and .nzRegistry Services (NZRS) were established. The office of the DNC brought in new policies and procedures, and in its first year the number of registrars jumped from 32 to 48, creating a workload so great it had to employ a compliance officer to keep pace with policy and procedure checks.

The response of the DNC Office was tested twice during its first year by the actions of a company calling itself Domain Names Australia (DNA), trading in New Zealand as Domain Names NZ. This first major scam highlighted the importance of maintaining a close relationship with the Commerce Commission, which used its legislative power to intercept mail directed to DNA. Successful legal action was then taken in Australia.

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On behalf of InternetNZ and NZRS, the domain name commissioner signed a service level agreement in April 2003, outlining the standard of service expected to be delivered in managing the .nzRegistry. This included register performance, register management, and SRS/DNS reporting. It was expected there would be 99.9 percent SRS system availability and 100 percent availability of DNS servers. Prior to October 2002 domain names could only be registered for 12-month terms. Once the shared registry system was up and running, registrations for up to 120 months were possible.[22]

The number of domain names registered increased from 124,945 at the end of March 2003 to 149,269 by March 2004. By the 2004–2005 year there were 53 authorised dot.nz registrars and the number of domain names registered grew 32,826 to 182,095 over the year to March 2005. A new dispute resolution process was put in place during this period. By 2005–2006 another three registrants were added to the SRS, with a number of others going through the approval process.

When the dot.nz domain name market was first declared competitive in March 2003 there were 27 registrars providing services; two years later the number had doubled.[23] On 8 April 2005, at 10.25 a.m., the counter on the dot.nz registry clicked over to 150,000 domain names registered in New Zealand. By September 2005 there were more than 200,000.

In December the DNC's office was forced to take its first action in de-authorising a registrar after an investigation into ongoing breaches of dot.nz policies and procedures. Breaches by Domain Name Management Services Limited (DNMSL) included registering customers' domain names to a company it was closely related to, and allowing that company to speculate in domain names, despite also being a DNMSL reseller. The action followed an earlier sanction and suspension by the registry for technical issues that had the potential to impact on the integrity of the register.

In the 2006–2007 year there were 50,000 new domain names registered, taking the overall number to 272,752; the number of dot.nz registrars increased to 72. In its fifth year of operation, the Office of the Domain Name Commissioner (ODNC) received 84 complaints through its dispute resolution service, mainly relating to unfair domain name registrations; 54 were deemed to be valid, 21 were settled through informal mediation, and ten were followed through to an expert determination. The remaining complaints were either withdrawn or dealt with based on standard policy. ODNC also obtained a High Court interim injunction against NZ Domain Registration Ltd (NZDRL) after a mass mail-out of letters seeking fees for registration of dot.net.nz domain names. It's not thought anyone fell for the scam.

In September 2007 the Domain Name Commission announced top level dot.nz domain names registered had reached 300,000. Domain Name commissioner Debbie Monahan said the rate of growth was showing no sign of slowing. The average rate of new domain names created each month in the 2006–2007 year was 7451, compared with 6280 for the previous. Most of the growth had occurred in the dot.co.nz domain. There were now 70 authorised registrars offering .nz names to businesses and the public.[24]

DOMAIN NAMES NUMBERS AND REGISTRAR NUMBERS

Second level domain	*Community of Interest*
.ac	Tertiary educational institutions and related organisations
.co	Organisations pursuing commercial aims and purposes
.cri	Crown Research Institutes
.gen	Individuals and other organisations not covered elsewhere
.govt	National, regional, and local government organisations operating with statutory powers
.iwi	A traditional Maori tribe, mandated by the local iwi authority
.mil	Military organisations of the NZ Government
.net	Organisations and service providers directly related to the NZ Internet
.org	Not-for-profit organisations
.school	Primary, secondary, and preschools and related organisations
	New dot.nz domains added by the end of 2007 included .maori (2001) and .geek (2005), .parliament (October 2005) and .bank (March 2007)

Glossary

Register (or Registry Database)	The list of domain names in the .nz Register originally run by Waikato University but transitioned to ISOCNZ and its wholly owned company Domainz from 1996. Domainz subcontracted the operation of the database component to Waikato until its new system was completed
Registry	The entity (NZ Registry Services Ltd) charged with managing the Register for the top level domain dot.nz
Registrar	Domainz represents registrars who are mainly ISPs or 'agents for the name holder.' Under Domainz new system which would be operated through the system developed by Glazier Systems, Domainz would remain the only party able to make changes to the Registry database
Registrant (Name Holder)	Anyone who holds or registers a domain name. They either manage their domain through a registrar or directly through the Registry (Domainz)

HIJACKERS BREAK AND MAKE LAW

From May 1998 ISOCNZ had been deeply involved in its second major domain name hijacking case with Oggi Advertising and defendant Cameron McKenzie. There had been high hopes that ISOCNZ's position as an impartial body might have been clarified in the 1996 case: Cadbury, Sanyo, and Xerox v David Ward of the DNC. Now it was being sued as the fourth defendant, with Internet Registries Ltd (Domainz) named as the fifth defendant. Its first come, first served approach was being challenged. This was one of the first court cases of its kind involving a country code registry in the world, and became the focus of widespread media attention.

Oggi Advertising had alleged ISOCNZ conspired to infringe its trademark and was party to the act of 'passing off,' or attempting to use someone else's trademark in a deceptive manner. The main defendant, Cameron McKenzie, had registered oggi.co.nz and attempted to sell the name back to Oggi Advertising. In previous cases the trademark holder, once convinced of ISOCNZ's independence in the matter, had targeted the individual or company that had registered the infringing domain name. ISOCNZ chairman Jim Higgins and Domainz chief executive Patrick O'Brien both denied the allegations. In fact Domainz's terms of service made it clear that accepting registration of a domain name indemnified ISOCNZ and Domainz against any liability in trademark disputes. When the case eventually went to court it was Oggi Advertising Limited v McKenzie (June 1998). The Court held that McKenzie's registering of the domain name would hinder Oggi in its business activities and was calculated to damage Oggi's goodwill.[25]

Peter Dengate Thrush acted as counsel and Gavin Adlam was solicitor for ISOCNZ and Domainz. "We took no part in the argument about domain names. We said from the outset we would comply with the orders of the court. There were no other orders made about us, no finding of any fault and ultimately an out-of-court settlement was reached between Oggi and McKenzie. Up until this point it had been a perfectly routine case; cyber squatter goes to court and the judge says, give the name back to the owner who's got a better claim. We were simply sitting on the sideline and agreeing to transfer the domain name if and when ordered to do so."

There was frustration that ISOCNZ and Domainz had been joined to this litigation in the first place. Oggi had not achieved anything by involving the two parties, other than what was offered prior to the proceedings. Having spent a lot of time and effort preparing their defence, the two parties sought costs. Oggi resisted but ended up having to fork out. "We got a substantial amount of our $50,000-$80,000 cost back. No one else was going to have a go after that," said Jim Higgins.

In summing up, Judge David Baragwanath in his second judgment agreed ISOCNZ and Domainz were unnecessarily implicated and had only been acting in the public interest as an impartial body.

> *The position of Domainz is quite different. First, as I recorded in the June judgment[26] the provision in disinterested fashion by them and their colleagues within the international scientific community of the invaluable facility of the World Wide Web is of inestimable public good. Secondly, they have made plain that they will facilitate any court ordered rectification consistent with the 'first come, first served policy' that is the only sensible practice if elaborate legislation, with its attendant cost, is to be avoided. Thirdly, prior to the hearing they adopted the position as to the disposal of the present litigation which led to my remark[27] "given the responsible attitude taken by Domainz it is, in my view, the responsibility of the court to devise procedures for any necessary rectification as may most efficiently permit correction without imposing cost or unnecessary burden on Domainz."[28]*

The Oggi case confirmed that people with intellectual property rights could have a claim on the domain name space, and affirmed the first come, first served approach. The judge's comments attracted worldwide press. "It was now clear that a ccTLD registry following our policies was safe from thousands of law suits. That was a fantastic vindication for us as we sought to balance intellectual property rights and the need to get large numbers of people onto the Internet quickly," said Dengate Thrush.

This was put to the test again in July 1998, when Electronic Media registered the names of 230 business, sport, and entertainment personalities. This was another clear case of 'domain name squatting,' where an unauthorised party registered Internet domain names belonging to major companies in order to sell them back for a profit. ISOCNZ was hoping this case would add further weight to establishing an international legal precedent to simplify the way disputes were handled in the future.[29] However this was also settled out of court.

Peter Dengate Thrush, founding member of InternetNZ and former president who succeeded 'father of the Internet' Vint Cerf as chairman of the international Internet numbering authourity ICANN in November 2007.

While the precedent had essentially been set, there were still those who felt Domainz should be doing more to protect the right of brand name owners. Tim Wood, director of ISP Ihug, had earlier in the year found someone had hijacked his domain, and while it had since been retrieved, he was concerned that the whole area was still a bit messy. "The main issue is that large corporate players are getting onto the net and finding that their domain name space has been taken by Joe Entrepreneur and it's taking a lot of time to go to court and get it back. Oggi and Ihug got back their domain names back but the Internet is still a bit like the Wild West. It would be better if it was a bit more regulated with a more hands-on, active roll and more funding allocated to controlling what domains are registered."[30]

In August 1998 Jim Higgins claimed New Zealand was ahead of most of the world in terms of the efficiency of its DNS and the way it represented users. It had registered more than 20,000 domain names at a cost of $96.75 for the first year and $74.25 for every subsequent year and was taking on new registrations at a rate of 1000 per month. In fact Domainz, a non-profit organisation, was now taking in $1.5 million a year and still considered to be in start-up mode.[31]

In October Patrick O'Brien insisted he had made good on promises to bring down domain prices. New Zealand now had one of the lowest domain fees globally and one of the highest service levels available for global registries. There were now 24,000 domain names registered, which meant New Zealand rated 12th out of 259 country codes. "Over 99 percent of names are listed within one business day – this will cost you about $250 in the UK, $300 in Australia and above $500 in Germany. In 1997 only 40 percent of customers paid on time and delinquent accounts averaged over four months; a year later over 80 percent were settled on time."[32]

However Domainz's dual role of registry and sole registrar continued to drive intending registrar and ISP owner, Peter Mott, crazy. "Mott's argument was that the people he sold domain names to were his customers, it was his data and he was the one who should keep track of where they lived, what their phone numbers were and take the money off them. All the registry should do is keep track of the data and point to him," said ISOCNZ legal counsel, barrister Peter Dengate Thrush. That view was contrary to many on the ISOCNZ council at the time. "There were these legal and mystical arguments about who was responsible for the client. We thought it was important to maintain a direct connection between the registry and the client. In our experience the only real trouble was with the registrars; they were commercial businesses and could go broke."

After attending international meetings representing the dot.nz country code throughout 1999, Patrick O'Brien became convinced of the value of moving to a shared registry model. A policy paper he presented in August 1999 proved controversial, envisioning that New Zealand Internet Registries Ltd, the parent company of Domainz, should act as contract manager, putting many of the

operational components of the DNS out to tender. This wasn't viewed favourably by those who had opposed domain registration becoming a lucrative business in the first place. While service delivery had improved considerably, and access was now opened up to a new breed of service providers, Domainz was still sole supplier and manager of the market. New Zealand's approach to the second level domain was generally regarded a sound model, however key governance questions remained, and the ownership structure of the domain, and Domainz' role as 'sole service provider' continued to resurface as an issue. [33]

PRESSURE TO PERFORM

O'Brien announced that he wanted help in developing next generation technology that would enable him to further automate the registration of domain names, and called for volunteers for a working group. A number of those wanting to be registrars, including Peter Mott, got involved in the process of investigating what was required for the Domainz Registration System (DRS). The first problem was that O'Brien wanted the development done using Microsoft software, when most in the ISP community were Unix people, said Dengate Thrush. He then required them all to sign non-disclosure agreements in the hope this would encourage the sharing of ideas. If they didn't feel safe putting their ideas forward in the planning meetings, O'Brien was concerned he would not get the information he needed to design the new system.

However the non-disclosure agreement also had the effect of preventing discussion within the Internet community. "You have to remember that this kind of discussion goes on under the constant spotlight of the most vigorous mailing list culture. People would ask, 'What is going on within the new registry?' and those on the working group would say 'We can't tell you.' What had been conceived as an idea for open sharing was soon turned around with statements like 'We've been gagged by Patrick O'Brien.'" This contributed to mounting disinformation and misunderstandings.

By the end of 1999 New Zealand had the third-highest ratio of domains per capita in the world, behind Denmark and Switzerland, and ahead of Sweden, Australia, the United Kingdom, Germany, Canada, Italy, Japan, and the United States. It cost about $60 a year to register a domain, one of the lowest fees charged by an Internet registry. Charges had dropped by 22 percent in the year to 31 March 1999, with substantial discounts for high-volume registrars. Most domain name registrations were submitted by ISPs, Web designers, and specialist service operators. Few users now approached Domainz central registry directly. About 88 percent of all domain names registered in New Zealand were in the dot.co.nz second level domain, up 38 percent on 1993. A healthy number of new registrations were from overseas companies wanting dot.nz versions of their Internet domain names to protect their trademarks, copyright, and corporate image, often as part of an international marketing strategy.

Domainz now employed nine staff at its Wellington headquarters and was operating seven days a week.[34] The first profit in its three-year history was announced at its AGM, reporting after-tax earnings of $451,007 to 31 March 1999.[35] At the end of 1999 Domainz was handling more than 3000 applications a month and processing most in a single business day. There were 45,000 dot.nz business domains registered in New Zealand and demand was rising about 80 percent a year. It was now obvious Domainz was in a position to begin paying quite large dividends to its shareholder, ISOCNZ.

Jim Higgins put forward a proposal that a foundation be formed to help fund Internet development, Internet education, and 'good works.' This further incensed those who believed the society should be operating on a not-for-profit basis and did not believe it should be developing

mechanisms to spend this large profit. This further complicated Higgins's dual role as chairman of ISOCNZ and Domainz, and led to several approaches to Peter Dengate Thrush to stand for council.

"When Jim decided it was time to step down from the chairmanship of ISOCNZ, he was reluctant to leave until he felt it was in 'safe hands.' This was a bit of an ask, as the role had a high workload, was essentially a voluntary service, and very high pressure on the political front. No one seemed terribly keen on the job. Councillors at this stage were elected from the membership, and the council then chose officers from among themselves, based on skills and willingness, to stand for the chairman's role," said former executive director Sue Leader. "Jim made a persuasive case that the time had come to make the chairman's honorarium attractive enough to bring some new blood in; it was set at $20,000 at the September 1999 strategic planning weekend." When Higgins's term as chairman – a title interchangeable with president – was up, he nominated Dengate Thrush as his successor, a position he took up in mid-December. Higgins remained chairman of Domainz.

The 'maiden profit' was to be invested in redevelopment of Domainz systems in order to cope with future growth. A proposal had been put forward to invest $500,000 in the DRS technology upgrade, which was expected to deliver easier navigation for users, e-commerce payment options, greater process automation and the ability for registrars to actively manage their name holding base. This was due for implementation in early 2000 with operational centres in Auckland and Wellington. Ample evidence of the need for that technology upgrade came when the Domainz web site went off air for about 24 hours in mid-March 2000, due to a fault at Wellington Internet provider Actrix. web sites hosted by Actrix, including the pages belonging to Domainz, remained inaccessible until the fault was rectified. Although a replacement card for the server was sent from Auckland it proved to be the wrong one, prolonging the outage. The problem was seized on by the anti-Domainz faction as further evidence of incompetence.

Peter Mott, founder of the ISP 2Day, found it extraordinary that an Internet infrastructure provider could put itself in a position where its site was down for so long. Mott had developed a business registering names, claiming to be the largest registrar behind Xtra. While 2Day's automatic domain registration system interfaced directly into the .nzRegistry server at Waikato University, after the switch over in May 2000 it would be totally reliant on Domainz. O'Brien said the new system would be run on mirrored servers in Auckland and Wellington, so there should be no downtime. Mott claimed the system, being developed by Domainz with Advantage Group subsidiary Glazier Systems, was unnecessarily complex and would be expensive for ISPs and customers. He said Domainz managed the database and set the terms and conditions for all those who wanted to register a name and had proceeded with its plans despite industry concerns.[36]

ISOCNZ chief executive Sue Leader said there was a general misunderstanding that the .nzRegistry DNS had gone off-line but insists that never happened at any stage. What had occurred was that resellers couldn't get access to the web site to conduct their business. The DNS itself was never at risk. Leader said Mott regularly complained about the slowness of ISOCNZ in responding to queries but she remained determined to keep on the case as quickly as she could. "I spent the majority of my time working on-line, and my email program – Pegasus Mail, of course! – popped an alert as every email came in. A common daily email load ranged from 50 to 100 messages, many from the different mailing lists I was on. I made a point of responding as promptly as possible, especially if they were from members. One day I opened an email from Mr Mott was time-stamped as being sent one minute earlier and, as I was reading it one minute later, the phone rang. It was Mott wanting to know why I hadn't responded to his email! I explained that I was reading it as we spoke, and then dealt with whatever business it was about."

BREAKING THE MONOPOLY

Opposition to 'the Domainz monopoly' escalated, with many in the technical community becoming engaged in what has been described as 'a religious war' over which style and philosophy of registry management was most suitable for the future. Domain name services consultant Joe Abley echoed the growing concerns that Domainz was acting as both registrar and registry. He said Domainz was competing with its own customers by maintaining a commercial relationship with the end user, or registrants, as well as ISPs that on-sold services to end users.

Much of the controversy could be traced back to the plan by international domain name governance body ICANN, under contract to the US Government, to turn monopoly domain name hosting company NSI into a shared registry system. It had previously had a US$5 billion contract with the government and the transformation meant it would now only be a registry with multiple competing registrars. In many ways this was the catalyst that got people thinking New Zealand should adopt a similar approach. That was certainly the model favoured by Abley, who had worked with Clear Communications and 2Day.

O'Brien had also been inspired that the NSI model but it was the way he was planning to adopt his SRS model that was the source of the growing frustration. Abley wanted a system that would allow any number of companies to operate as registrar, and saw no reason why numerous registrars couldn't operate with one register or list. "The areas of responsibility would be split up – there would be a list of domain names; a registry that would administer the list and a number of registrars, that could sell domain names to anyone who wanted them." Abley wanted to see Domainz act only in one role or the other, either as keeper of the registry on which all domain names were listed, or as a reseller of services to those name holders but not both.[37]

Patrick O'Brien believed the key issues boiled down to whether you had a thick or thin registry model. The 'thick registry model' meant registrant and registrar details were held in the same database. This was the model established in July 1996 when the agreement was struck with Waikato University, and under which ISOCNZ contracted Domainz to run the dot.nz space. The 'thin registry model' essentially came out of the ICANN process, originally created for the dot.com space, where only details of registrars were maintained, and they in turn managed details of registrants.

The religious war about thick and thin, and several variables in between, touched on fundamental beliefs about what was appropriate for dot.nz, and first came to the surface during early meetings at Waikato University over who would manage the domain name process and how. O'Brien insisted Domainz, created by its sole shareholder ISOCNZ as a 'legal and commercial firewall' to its members, had become an easy target, particularly through the period of changes to the licensing.

A motion to adopt a shared registry system was initially 'heavily voted down' at the 1999 ISOCNZ AGM. A working group was established to investigate shared registration systems and other registry models.[38] The SRS Working Group, Rick Shera, Steven Heath, David Farrar, Don Stokes, and chairman Professor John Hine of Victoria University of Wellington, was eventually established on 31 March 2000 and consulted with hundreds of people within the Internet community. This was largely a listening process, which reviewed the issues and the best overseas models.

Eager to be rid of the remaining portions of DNS management which it was still managing on contract for ISOCNZ, Waikato University had set an initial deadline of April 2000. Eyebrows were raised across the community as Domainz Glazier-Advantage DRS implementation came perilously close to deadline. Concurrently there were public meetings in Auckland and Wellington and a process for submissions on the future approach. The clear consensus throughout was that the current model wasn't working well. This was confirmed when the .nzRegistry, 'down for maintenance' for a maximum of four to eight hours in May 2000, remained off the air for three days after further problems were encountered. People couldn't register new domain names or

make changes to server details during that time. By the time the new Domainz registry system was up and running in August 2000, it was now allegedly costing $750,000 and at the centre of a huge controversy. "People said it was way over budget but it wasn't; it was just that we spent more money than intended because we were forced to stay with Waikato for three months longer while we sorted out some bugs," recalled Jim Higgins.

There were wide-ranging views about how things should be done and while many discussions had the air crackling, other opinions suggested more arcane outcomes. While not necessarily in a form that would easily translate into a motion at an InternetNZ meeting, Perce Harpham's[39] contribution certainly gave pause for thought. Harpham, technology industry visionary, Computer Society Fellow, and regular attendee at InternetNZ meetings, believed the system of domain names in New Zealand was unnecessarily complex, and he was uncomfortable about the way Domainz was handling things. In a submission to the Ministerial Inquiry into Telecommunications, he indicated it might be preferable, for the preservation of the dot.nz domain space, that it be owned by government rather than a private organisation.

Many feel that the process has been captured by a few and that the name space is being managed to extract the maximum profit from it rather than to bring the greatest benefit to the users. For example the cash reserves of the subsidiary probably now exceed $2,000,000. But the domain name issue is much larger than the present problems about its management. The main purpose of obtaining a domain name of one's own is to have a unique identification which is transferable between ISPs (Internet service providers) without having to advise one's contacts of a change of email address for example. The use of one's own domain name thus allows full advantage to be taken of competition amongst ISPs. In the same way ownership of one's own telephone number would be a great stimulus to competition.

In my view the portability of phone numbers and of domain names are inextricably linked. Indeed it takes little imagination to envisage a time in the near future when 'Internet phones' are the norm instead of a $500 to $1000 luxury. It is then unlikely that one would even use a phone number directly. As with present day memory cellphones one would scroll to a name and 'click'v. The same technology that is used to translate a domain name into an IP ('Internet protocol') address would provide the telephone number. An IP address is simply the number for the computer that is to service the email or whatever. A different form of number for a telephone does not represent a problem.

It would seem desirable for the registration of telephone and domain names to be carried out by a government agency. Indeed there is a good case for saying that, as in Sweden, the email address, including the domain name, should be allocated at birth (of individuals and companies etc). Also that telephone numbers and other transient information should then be accessible from a government database. There are privacy and other issues of course but whatever decisions are made now should be in the context of vision for the future.[40]

Meanwhile the SRS Working Group, which had been established to review the registry options for the future, had put forward nine specific recommendations to the council about the need to remove the registry from Domainz so that it became both a registry and registrar, with the registry having no contact with the end user. The council didn't reject the report, but did reject the recommendations as premature, ordering they be struck from the report that went to the AGM.

Long-serving ISOCNZ council member David Farrar was among those who wanted to see the monopoly position of Domainz significantly reduced. He described the new registration system and the technology used to manage it, as a disaster. "They didn't carry their clients with them, they didn't

test it properly, the project management structure was absent and the registry was down for two or three days as they tried to transition. There were over 100 faults reported and Domainz weren't even keeping a list of them. People, including myself, started to keep a list of the faults publicly and that was probably the final straw that made people switch to the mindset that we had to change it." Farrar said a number of committee members were determined to get their way and inserted the recommendations for a shared registry in the general business section of the agenda for the forthcoming June 2000 AGM.

OUTBURST BECOMES CATALYST

Many of the early Internet community boffins were not the type to keep their opinions to themselves. If they had a beef about something they would discuss it openly and often fiercely on relevant newsgroups and mailing lists. Anyone logging on would be met with a tirade of concerns, complaints, and criticisms often expressed in 'inflammatory and intemperate language' deriding ISOCNZ, Domainz, various members of either group, and often specifically, Patrick O'Brien.

Several journalists regularly logged on to observe the chaos, knowing that certain threads would provide ready-made copy, which served to fuel wider concern about the internal politics of Internet governance in New Zealand. As well as the petty exchanges, there were genuine disputes, policy issues that needed addressing, and confusion as everything transitioned from the virtual anarchy of old. ISOCNZ was so frustrated with how its was being perceived, largely through the newsgroup postings and subsequent media coverage, that it even hired a PR firm to advise it on how to improve its image, to little avail.

Then four years of frustration seemed to come to a head with an acrimonious outburst from Manawatu Internet Services founder Alan Brown, who targeted his angst at Patrick O'Brien in the ISOCNZ mailing list. The resulting defamation court case seemed to catalyse support for Brown, not necessarily because he was the most likeable character, but because the legal action seemed to strike at the heart of the central premise of the on-line community, namely freedom of speech. While it had long been known that the same law that applied on terra firma also applied to cyberspace; and several individuals had been warned about the fine line they were treading, no one had been foolish enough to test it. Alan Brown had been riding the line for some time, then stepped way over.

Some say the court action initiated by Domainz on behalf of its chief executive was the point where much of the Internet community lost confidence in Domainz, resulting in a greater solidarity among those who sought to overturn the old guard at ISOCNZ. Others simply saw it as a long-overdue response to frequent misuse and abuse of the open forum environment. Brown's unfortunate post was essentially an over-reaction to a series of seemingly trivial events, chronicled by an over-zealous systems administrator in the belly of the WCC IT department. In September 2003 David Zanetti, Unix systems administrator and postmaster for the council, decided to post his side of the defamation story on Usenet and his personal blog.

Zanetti managed the WCC DNS entries and was listed as the technical contact for the wcc.govt.nz domain. In late 1999 Domainz embarked on a 'data scrubbing exercise' and sent emails to domain administration contacts, asking them to submit corrections. The domain information details had been updated two months previously to include Zanetti's boss Jos Van Herk, who received the email. The contact details were correct, other than the need to replace a fax number. In his reply to Domainz, Van Herk indicated two changes should be made: the fax number and adjusting the name holder from Wellington City Council – ITS, to 'WCC – IS,' reflecting a simple shift in the business unit name.

Nothing more was heard until a confirmation email was sent to Van Herk a month or so later. The request for changes had slipped his mind so he passed the email to Zanetti with the comment that he couldn't recall asking for any changes and was surprised anyone could have made them without using the council's Domainz key. Zanetti then set out to determine who had requested the changes. He called Domainz on Wednesday 22 December 1999 but a customer service representative would only state it had been requested by the name holder Van Herk. He asked to speak to Patrick O'Brien, who wasn't available. In the interim Van Herk recalled his reply to Domainz email. "I was reasonably annoyed with Jos at the time, and by the time Patrick called it was quickly sorted out that Jos had made the request."

What Zanetti now regretted was his subsequent phone conversation with O'Brien and having posted his frustrations about the way the changes were handled on the ISOCNZ list. "Patrick was actually very helpful in resolving the problem, and I admit I was probably more combative than I should have been. I did mention the media but said I would be sorting out with the WCC what I'd be doing about questioning the standards publicly." Near the end of the call O'Brien asked to speak to Zanetti's supervisor. Zanetti alleges he sought Van Herk's permission to post the details of the exchange and the perceived security problem that was highlighted to the InternetNZ mailing list. He insists permission was granted but that a disclaimer be added that these were his own opinions and not those of the WCC. "Jos did not mention that he'd actually agreed with Patrick that any further issues would be discussed with him first. I would discover that later."

Zanetti said he wasn't in the right mood to be making a posting as he was agitated by a series of events, so he headed home and later in the evening wrote the posting in a calmer, clearer mood. As requested, a disclaimer was added to his message before it was sent from his home address. Zanetti's posting on 22 December outlined the series of exchanges and questioned the procedures of verification for domain name changes, considering this had been enabled through a simple exchange of emails. Didn't that invalidate the use of Domainz authorisation keys and was there, in fact, high enough security at Domainz to prevent others from maliciously manipulating domain name details?

The next day, 23 December, Zanetti discovered that his overnight posting was the centre of a controversy. Patrick O'Brien had sent an email of complaint to Van Herk. Zanetti was hauled into his boss's office and instructed to 'cease all use of Internet discussion forums, both at home and at work.' He'd been gagged. Zanetti admits he continued connecting with others in the Internet community through IRC. Among those he hung out with on-line was Alan Brown, who wanted to post about the gagging affair. "I made it very clear he was not under any circumstances to post about it. He did, and I expressed my annoyance to him, but he was far too involved in wanting to use my situation against Domainz."

Before he left work Zanetti was asked to remove the Web page on the advice of council's lawyers. "I explained it went to a mailing list, and then on to Usenet, and had no real way to expunge it. The request was dropped." A further meeting was called at the WCC, at 9 a.m. on the morning of Christmas Eve 1999, to decide what the next step would be. He was met by his boss, his boss's supervisor, and a human resources person. "A section of the WCC code of conduct was pointed out to me saying that that no employee will bring the WCC into disrepute, and I had done so by having a complaint made against me and the council. I argued that I had not done so, that I had only posted with permission, and that Patrick's assertions about it coming from a WCC email address were clearly wrong." At that point Van Herk insisted he had not given permission and that there had been a misunderstanding. "I was pretty gutted that when the chips were down my boss couldn't recall if permission had been given … He was a good boss and whether or not I had permission or not made no difference really."

Patrick O'Brien had requested an apology. Zanetti insists both the WCC supervisors agreed there was nothing the WCC should be apologising for and that the concerns raised in the posting were valid although they didn't agree with the way in which they had been expressed. The human resources person however remained adamant that an apology must be made and the lawyers had already negotiated a chunk of it. They considered the threat of a defamation suit was serious and clear. "At one point the question was raised, why we were bothering with a supplier who we spent $50 with? The relationship with such a small supplier didn't seem to make sense [to them] but I pointed out that not doing business with Domainz doesn't give you a lot of options for holding a .nz name. 'Of all the days, why'd you pick Christmas Eve!' asked the HR manager."

The apology was drafted for discussion with O'Brien following the meeting. Zanetti was then provided with a copy of the apology and asked to post it. Once that was done he was asked by members of the ISOCNZ list if he was under any pressure to make the post. "Well, bluntly, I am bound by my contract to follow reasonable instructions, and I didn't feel like losing my job over this. Besides the HR manager had mentioned that I might want to keep a low profile, as 'O'Brien seems to be gunning for someone,' and that someone might be me if I was to aggravate the situation."[41]

O'Brien insists the offending posting wasn't an isolated incident. There had been some earlier issues regarding employees and emails at WCC, which may well have influenced his strong reaction. However, talk of him being involved in a gagging, he said, goes too far. While Zanetti got off lightly, the day after his posting a response was made to his on-line statements by one Alan Brown. He questioned how long it would before O'Brien would stop wasting Domainz and ISOCNZ money 'by again threatening baseless legal action in order to gag public criticism.' He accused O'Brien of 'barratry.' He then proceeded to put his foot further into his mouth with a number of unpleasant descriptions of O'Brien and his motivations, which he claimed were not in the interests of the welfare of the Internet in New Zealand, concluding with 'roll on the govt removal of the ISOCNZ/Domainz profit-driven monopoly.'

Dengate Thrush said the board of Domainz saw Brown's actions as an attack on Domainz and its CEO that would only escalate if left unchecked, a move that was supported by most committee members. "It was a corporate decision made for business reasons to protect an employee. They felt that if they didn't protect this CEO they'd never get another one." Alan Brown was now facing defamation charges. If that wasn't enough, Brown then reacted to the threat of action by scanning the statement of claim, which contained the original alleged defamation, and posting it on his own web site, then posting several more messages to the list. Other ISOCNZ members retrieved his original message and posted it to the society's public mailing list and newsgroup, ensuring vastly wider distribution.[42]

In December 1999, the first time ISOCNZ allowed on-line voting, the disquiet about Domainz was openly displayed, but a move by Zanetti to undermine its commercial base was dismissed, drawing comment on the ISOCNZ newsgroup.

WORKING FROM THE INSIDE

Keith Davidson from Wairarapa ISP Winz (later wize.net) had maintained a vague interest in the governance of the Internet from the mid-1990s. "I was quite taken with this idea being promoted by the ISOC that the Internet would be a tool for everybody whatever their maxim and that it was about the principles of sharing, open source, and all those concepts alien to someone coming out of the capitalist Murdoch empire. It was a different methodology and structure and it quite took my fancy so I kept a watchful eye on development and on the society."

In 1998 Davidson decided to get involved, stood for council and became the second ISOCNZ treasurer. Some aspects about the structure of the registry, including the monopoly over the dot.

Sunday December 12th, 1999
MOVED: (David Zanetti):
>
> "That the existing 1996 Council policy stating that the
> DNS be run on a non-profit basis be ratified by this
> AGM as binding policy on the Council"
>
> MOTION LOST (Against 26/For 20/Abstentions 7: John
> Vorstermans, Gavin Adlam, Keith Davidson, Ernie Newman,
> Judith Speight, Leo Neal, Graeme Osborne)

Above from annual general meeting of ISOCNZ. Clearly council dont wish to stick with the original policy of operating the DNS on a cost recover basis with any operating excess being applied to DNS related activity.

If industry does not stop these people soon, it will be too late.

regards

Peter Mott
Chief Enthusiast
2Day.com

Peter Mott, founder of 2Day Internet fought long and hard against the dual roles of Domainz as monopoly provider and competitor in the domain name marketplace. Mott's company was acquired by Iconz in 2005.

nz space, and the direction of the organisation were of concern. "I thought, 'Its no good arguing from outside; you've got to get inside if you want to help shape these things.' Bigger registrars got a bigger pricing break and I was thinking, 'This should be a level playing field where everyone's treated the same, so that there's no barrier to entry.'"

Even as treasurer, his concerns increased. "From a financial perspective I couldn't get access to information from Domainz. I would only get a copy of the annual report at the annual general meeting. I was thinking, 'Now we're the 100 percent shareholder and I'm the treasurer, so why can't I see our subsidiaries' figures until after AGM? Why the need for such secrecy? Where's our commitment to openness and transparency?" He believed the 'secrecy' was simply Domainz director Patrick O'Brien's method of business; to him information was power and he didn't want to share that, he wanted to keep it as close as possible. "There was no doubt he was under pressure but I think his DNA was more suited to the corporate world, where you never reveal any information unless you had to; unless you were standing in court or under obligations to the stock exchange."

Davidson wanted to turn that traditional model on its head and put everything in the public arena unless there was a good reason for confidentiality. He and a number of others on the ISOCNZ council, with growing support from the wider Internet community, were tiring of the endless debates about Domainz and the technology for managing the registry.

IP SPECIALIST FLIES HIGH

Intellectual property, competition, and Internet law specialist Peter Dengate Thrush began taking an active role in the international governance of the Internet when he became involved with the ISOC of New Zealand in 1995.

His eloquence and deep knowledge of Internet law and the complex issues surrounding domain name and country code management meant he quickly gained the confidence of senior people within the wider Internet community. In December 1999 he stood for two terms as InternetNZ chairman, and was chairman of the International Affairs Committee until it was disestablished in 2006.

On 3 November 2007 Dengate Thrush was unanimously elected as the successor to Vint Cerf 'father of the Internet,' as chairman of ICANN at its meeting in Los Angeles. He had been involved with ICANN since its inception in 1998, participated in the international working groups that lead to its formation, and served on a number of its committees.

Retiring chairman Vint Cerf said the appointment was a clear signal that ICANN had matured. "ICANN has moved from a foundation state to a steady state. Peter understands that, and the Board's role, and is a great choice to keep the organisation strong and focused." Dr Paul Twomey, ICANN's president and CEO, said Dengate Thrush's long involvement in ICANN meant he knew the history as well as the current players and issues. "His legal training gives him a strong understanding of contracts as a key mechanism in ICANN, and his networks within industry, particularly the ccTLD community helps ICANN with its global responsibilities."

Dengate Thrush said ICANN was a unique model supporting a global community. "The model works because it stands for one global Internet that is co-ordinated not controlled. After nine years ICANN is well placed to face the challenges of the future … I think our biggest challenges are about serving the global audience. At a technical level there is the challenge of introducing international scripts at the top level for both gTLDS and ccTLDs, as well as new processes for introducing what may be a large number of generic top level domains."

At the organisational level, he said, ICANN needed to expand its global activity and constantly increase international involvement, as well working on the completion of the Joint Project Agreement (JPG) with the US Government,[43] for the full transition of the DNS to the private sector.

InternetNZ president Peter Macaulay said it was a real accolade to have a New Zealander as ICANN chair and believed Dengate Thrush would deliver an inclusive and effective style of leadership.[44]

Dengate Thrush had trained in science and law and his initial involvement with ISOCNZ came five months after he had gone to the independent bar. In September 1995

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he was asked to provide pro bono legal advice on the first come, first served policy, and the formation of Domainz. He was involved in several high-profile legal cases over trademark disputes relating to the use of domain names, and his interest in international Internet governance issues had him regularly attending meetings that were likely to have an ongoing impact on the future role of country code managers.

He had observed events relating to Internet governance unfold from 1997 when US Department of Commerce green and white papers were being discussed at meetings around the world. When ISOCNZ chairman Jim Higgins formed the ISOCNZ International Affairs Committee, he was asked to join, along with Domainz CEO Patrick O'Brien and ISOCNZ chief executive Sue Leader. The committee prepared a submission for the Sydney meeting of the World Intellectual Property Organisation (WIPO) series of meetings on trademark and domain name clashes.[45]

BOSTON LEGAL LEGACY

At his own expense, he attended the final international meeting in Boston in 1998, discussing the US whitepaper proposals for a new independent Internet governance body. The outcome was the formation of the ICANN. A small group from the Boston gathering, the Boston Group, continued to meet and make observations on how the proposed bylaws might be improved, in particular to better represent the various country code managers. Dengate Thrush attended the first meeting of the interim ICANN board in Singapore in late February 1999, which resulted in among other things the formation of the Domain Name Supporting Organisation (DNSO).

His continued involvement in meetings of the Asia Pacific Top Level Domain Association, regional association of ccTLD country code managers, and in various capacities, including representing the MED at Governmental Advisory Committee (GAC) meetings within ICANN, to ensure New Zealand's interests were represented. He was in Washington DC in September 1999 as part of the DNSO election of its first directors, when NSI signed its accord with ICANN and the US Department of Commerce, transfered the dot.com contract to ICANN.

After co-chairing a formation meeting in Wellington of the Intellectual Property Constituency, he was appointed to ICANN's Independent Review Advisory Committee. In November 1999, he attended the ICANN AGM in Los Angeles, when the idea of a separate body for the ccTLDs was first mooted. He eventually became Asia-Pacific representative on the ccTLD Administrative Committee, developing the concept of the separate Country Code Names Supporting Organisation (ccNSO). He drafted the initial bylaws, and chaired or co-chaired meetings of the ccTLDs on this topic. At the Shanghai meeting in October 2002 he led the top level country code managers in a withdrawal from the DNSO.

The failure to reach agreement with the ccTLDs was one factor that led ICANN CEO Stuart Lynn to start a major restructuring exercise in 2002. By mid-2003 it was accepted that there would be a ccNSO; Dengate Thrush was one of the first two directors elected to the board at the first meeting in Cape Town in December 2004. "I was always a supporter of the concept of a strong ccTLD body within ICANN … Our issues included financial support

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of ICANN as a general policy-making forum for all the Internet infrastructural resources and the key power and control issue; for example, who had authority to change the record in the database of country code managers?"

Dengate Thrush believed this should be up to the local Internet community in each country. "We were also very concerned that laws governing the Internet in each country should be made in, and according to, the laws of each country. We felt ICANN's rulings should only be binding in those areas where national laws were insufficient, and international agreement was necessary; for example, in issues relating to interconnectivity. In the end, the bylaws of the ccNSO reflected this balance."

RALLYING FOR THE REGION

At the Yokohama ICANN meeting in June 2000 Dengate Thrush was elected senior vice chairman of the Asia Pacific Country Code (APTLD) and became chairman from late 2003 until he stepped down in 2007. "APTLD's members come from a huge region, which begins off the coast of Chile and crosses the Pacific, and includes all of Asia to the shores of the Mediterranean Sea. Just getting to know all the managers in the region is a challenge; it takes about 11 hours' flying time from New Zealand to reach the centre of the region. From the Pacific islands it could take up to a week, depending on schedules. A regular cycle of three meetings a year was needed to meet across the region to try and improve communications, and raise member awareness."

The regional organisation APTLD soon formed a clear idea of its mission, with members agreeing to fund a secretariat and letting a contract for the Taiwan country code (dot.tw) registry, which helped get it off the ground. It was incorporated in Malaysia and a full-time general manager[46] appointed. By that time the APTLD secretariat was being run by InternetNZ, after a successful tendering process, and had become a regional partner of ICANN.

Dengate Thrush saw genetic traits that may have prepared him for his role. His father, Wing Commander Ron Thrush, had been involved in electronic data processing from his early days with the Defence Department, and his father-in-law, Don Dengate, had came to New Zealand from Australia with Burroughs Corporation, to ensure there was adequate training to operate the new B6700's mainframe computers being installed across the universities. Don transferred to Burroughs HQ in Detroit but daughter Liz stayed on in New Zealand, marrying Peter in 1979. Both served as councillors of Internet NZ.

While attending a meeting of Internet governing body ICANN in Marrakech, Morocco, Dengate Thrush learned of the tragic loss of his wife Liz, his father Ron Thrush, his brother Gavin and family friend Heather Taylor. They'd been killed at a notorious black spot on State Highway 2 near Wellington, on Friday 23 June 2006. The four had just emerged from a successful business meeting on the rainy winter's night when they were struck by an oncoming car.

Dengate Thrush rushed home, accompanied on most of the 26-hour flight by InternetNZ executive director Keith Davidson, who met him at London's Heathrow airport. Liz Dengate Thrush was an IT entrepreneur with a 26-year career in IT, who had just launched a new business, Brain Fuel, which offered a package that allowed a number of New Zealand Qualifications Authority (NZQA) accredited certificates to be completed on-line.

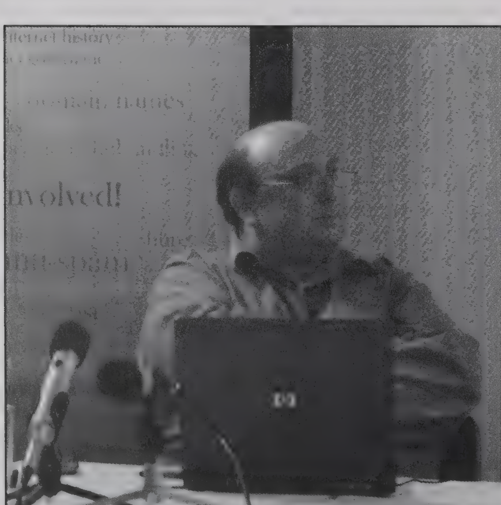
15

The proxy revolution

Changing of the guard

I must say I know of no forum in which an individual citizen has the freedom to say what he likes and in any manner he wishes about another individual citizen with immunity from suits for all consequences.
Judge Ross, in his summing up of the Alan Brown defamation case, 3 May 2000.

As the cosmic clock ticked over into the new millennium, debate about the struggling Domainz registry system, the 'religious war' over which model was best suited for the future and heated exchanges about the Alan Brown defamation case dominated the ISOCNZ mailing lists, adding to an air of conspiracy.



David Farrar, long time blogger and change agent. InternetNZ Archives.

Jim Higgins, who remained chairman of Domainz, claimed certain individuals had begun to gather a 'clique of geeks' around them who didn't like the way the ISOC and the registry company were being run. "Some of them were quite unpleasant people who tended to live in dark rooms, and were what I call email heroes - feisty on email but when you looked them in the eye, it all turned to custard."

David Farrar, who had been involved at some level with ISOCNZ since its first year of operation, had been caught releasing confidential council material to anti-Domainz campaigner Peter Mott and others who were lobbying for a shared registry. He 'fell on his sword' and voluntarily resigned from the

council, just ahead of the June 2000 AGM. Chairman Peter Dengate Thrush and executive director Sue Leader had become aware of a sudden 'furious growth' in membership applications. "They weren't the run-of-the-mill membership applications; it was quite clear something was going to happen."

At the ISOCNZ annual general meeting on 23 June 2000 everything that had been fermenting beneath the surface hit the fan. About 100 new members had passed on their proxy votes. David Farrar and council member Peter Mott between them held 75 percent of the proxy votes, other key movers for change were Roger de Salis, an ISOCNZ councillor and former director of Domainz, and ISP owner, Robert Gray. Their goal was to overturn the council and board and move things quickly to a fully shared registry system.

Half the council of 20 were due for re-election. The proxy votes overturned nine of them. Keith Davidson was the only one up for re-election to retain his seat, receiving 235 votes; the only time any standing member had received more than 200 votes for any position. The incoming council was Rick Shera, Andy Linton, Steven Judd, Robert Gray, David Zanetti, Steven Heath, Simon Blake, Arron Scott, and Jordan Carter. The new council and board voted to accept the SRS model and the recommendations of the 'Review of Registry Structure of the .nz ccTLD,' commonly known as the Hine Report.

In general business John Hine presented the Domainz Model Review Working Group report; a decision was made to remove the registry function from Domainz which would be maintained as a registrar. It had 12 months to accomplish this. It was also agreed to have an open working group consult with Domainz, ISPs, and registrars and develop a full proposal on a redesign of the DRS technology. ISCONZ would retain the management of dot.nz and Domainz would become a wholesaler. There would be a major structural change.

CRISIS OF CONFIDENCE

The AGM also directed the incoming council to commission an independent review of how Domainz had performed with regard to the design, construction, and implementation of the existing system, including risk management, user specifications, documentation, communication, and the technical issues.

An earlier meeting had passed a resolution supporting the court action against Alan Brown, but that was overturned with a fresh motion at the AGM 'deploring the defamation action carried out by the CEO of Domainz against Alan Brown,' with a number of abstentions. A further motion was carried that the AGM deplore the fact that Domainz was financially supporting the defamation action and directing the incoming council to request the Domainz Board withdraw its support.[1] The minutes of the meeting seem to ignore the fact that it was Domainz that had brought the action in the first place, believing it needed to take a stand to protect the credibility of itself and its chief executive.[2]

There was a vote of no confidence in the board of Domainz, which resulted in a long discussion about what that literally meant. Domainz chairman Jim Higgins and board members David Quigg and David Bain refused to bow out, questioning whether the proxy vote was legitimate. The council took legal advice. In the meantime Domainz board members James Scott and Peter Dengate Thrush resigned, believing it was untenable for them to continue without full support.

The AGM directed the incoming council that 'rules of cabinet secrecy were inappropriate to an incorporated society and 'the practice of collective responsibility be terminated forthwith.' Councillors would be able to continue to speak in public against any decision they disagreed with.[3] Dengate Thrush explained there had remained an element of tension between the policy of previous chairman, Jim Higgins, who had wanted to keep ISOCNZ business confidential, including the management of the dot.nz domain name, while members of the Internet community felt this information should be publicly available. He had attempted to change the culture of meetings to become more free and open, including making MP3 files and copies of the minutes available on the Web.

InternetNZ executive director Keith Davidson.

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which I point to as justifying an increase in the general compensatory damages are these.

(i) Defendant's improper motive as demonstrated by publishing in the wider fashion referred to without prior reference to the plaintiff.

(ii) The nature and extent of the publications themselves, to a site where the comments were far more likely to be seen by the plaintiff's colleagues and customers, with World Wide Web accessibility giving potentially infinite circulation.

(iii) The failure of the defendant to cease and desist upon notice being given to him of the proceedings, and the opportunity, not taken, to apologise at that earlier stage..

(iv) An unsuccessful plea of truth is a further factor which I may take into account as tending to increase damages.

(v) The excessive nature and extravagance of the words themselves in the first statement, quite beyond words necessary to make the point sought to be made – these amount to a further aggravating feature.

(vi) Defendant's behaviour, since the matter referred to in (iii) above, appears to continue to be motivated by ill-will towards the plaintiff. This is shown in as much as even at trial he continued towards the plaintiff in an insulting manner, describing him during cross-examination as "a flaming idiot". By this stage the plaintiff was no longer even working in New Zealand, and there is no evidence of a continued connection between them.

9.03 As to the actual assessment of damages, they must bear some relation to the wrong done, and be adequate to compensate an indignant and injured man who was in a semi-public position of some responsibility whose feelings have been hurt and name tarnished. The defamation having been established, the damage

Judge Ross in the case Domainz vs Alan Brown was unimpressed by the fact that when Brown was offered the chance to apologise, he reacted by making further defamatory allegations for allocating and managing domain names in the previously anarchic Internet environment.

At the next ISOCNZ council meeting on 7 July 2000 at the Museum Hotel De Wheels in Cable Street, Wellington, James Scott was reappointed to the Domainz board and although nominated, Dengate Thrush stood down in preference to a nominee who he knew would make the right changes at Domainz. Having sat for a year as ISOCNZ chairman, with one year to go on council, Dengate Thrush did not believe he would, expecting that role to go to Roger de Salis, who represented a new group within council that wanted him to stand. However de Salis declined the role, preferring to focus on his work within Domainz and Dengate Thrush was re-elected as chairman for a second term.[4] One of his first tasks, based on legal advice, was to serve notice on remaining board members, Quigg, Bain, and Higgins. An interim board was appointed.

"Jim did excellent work in the founding days of both ISOCNZ and Domainz, and it was advantageous to have him in both places at once, but as the organisation matured and there was increasing community displeasure with Domainz's performance, that position became untenable," said Dengate Thrush. Back in the chair, he was now better able to support the new shared registry approach recommended by John Hine and his working group. The council requested the new board commission a third-party report on the DRS implementation in its entirety.[5]

David Farrar said the subsequent report was 'a damning indictment.' It had listed all the security vulnerabilities and management issues and 'would not have gone down well with the public.' As Domainz was becoming a competitive company it wouldn't have been right to reveal its weaknesses. The report was considered, adopted, and destroyed because of its 'highly sensitive' nature.

The June 2000 AGM had been the flashpoint for change, shifting the direction of both organisations, responsible for the stability and welfare of the Internet in New Zealand. Throw in a clash of cultures, a defamation suit, a new IT system that didn't live up to promises, and vested interests, and you have a recipe for revolution. "There was no one factor," recalled Farrar. "When you need to effect change you can't use a scalpel, you use a very blunt instrument. I helped roll some people off council who I considered to be quite good friends, whom I had incredible professional respect for. It was actually a quite painful experience for everyone concerned. The only way was to say, 'Everyone on council has to go.' Most of those people who were knocked off, to their great credit, stayed involved and are now still making some very good contributions."

Most of those who gave their proxy votes to enable the AGM overthrow failed to renew their memberships the following year. It was agreed this could never occur again. Ultimately a new ruling was passed that you had to be a member for three weeks before voting.

Chairman Dengate Thrush was eager, after two 'tempestuous years,' to see a shift in emphasis away from the registry. He continued chairing the International Affairs Committee, strengthening the role and rights of country code managers and ccTLDs within ICANN. He set up ISOCNZ's Social Impact Committee, which was monitoring and commenting on the effect the Internet was having on the community. It got behind the fledgling Internet Safety Group, which was concerned about protecting children on-line and was involved in discussions around the use of the Internet to breach a court order, suppressing the name of a wealthy US businessman accused of importing cannabis at the time of the America's Cup in 2000. The *NZ Herald* reported:

> *Billionaire American Peter Lewis in the country for the America's Cup appeared in the Otahuhu District Court on drugs charges. A* NZ Herald *reporter was given the offender's name and that he was up on cannabis charges through an anonymous tip to the newsdesk, which said he had some connection with the America's Cup Regatta.*
>
> *A second caller had suggested a "secret deal" had been done to free the man in exchange for a donation to the Odyssey House drug rehabilitation programme. His lawyer Marie Dyhrberg, however emphasised later that the $53,000 payment was not part of any court order. Reporter Josie Clarke arrived in court in time to hear Judge David Harvey discharge Lewis without conviction before urging him to enjoy the ambience of the Waitemata Harbour.*
>
> *This was despite the fact that Lewis had imported more than 100g of cannabis material, including resin or hashish, which is a Class B illegal drug and carries a penalty of up to 14 years' jail for bringing it into the country. Even though Judge Harvey had granted final name suppression and lawyer Dyhrberg had leaned over the press bench to warn Clarke not to "try anything cute because we'll sue the arse off you and he has the money to do it," the reporter's interest had been piqued.*

Further inquiries by the Herald *revealed how wealthy Lewis was and its lawyers filed an application to overturn the suppression order, launching a case that involved more than a dozen court appearances and judicial conferences, costing the* Herald *more than $100,000.*

US newspapers, meanwhile, began their own inquiries and, unbound by the suppression order, had no qualms about publishing the billionaire's name in their printed editions and on the Internet.

While Dyhrberg opposed the Herald's *campaign to unmask her client at every turn, disputing its right to apply to have the order quashed, and even trying to stop it seeing her written submissions to the court, even appealing to the High Court, the ruling came down in the* Herald's *favour.*[6]

Dengate Thrush said the case was an early example of the Internet making something which had worked reasonably well for a century, redundant and unworkable. "By placing information on a web site outside the country, it was completely outside the jurisdiction of the New Zealand courts. While this had been true previously with international radio, TV and the press, the whole concept of suppression was rendered moot by the Internet." Regardless of the merits of the cannabis case, he said suppression was in fact a useful tool. "Our concern was for cases which would surely come; for example the naming of children in sex cases, where the protection of their identity was no longer possible. We called for a study, and for careful thought to be given to establishing the balance of restricting information with the administration of justice, including never naming parties in court or any court documents *ab initio*[7] if it relied on basic and established laws, in recognition that the Internet allowed millions of people to be instant global publishers simply by possessing a desktop computer and an Internet connection. We said that the distinctions possible between informing people of the web site, which possibly breached the order when done from inside New Zealand, and visiting the site and reading the information which probably wasn't, were all rather irrelevant. A new paradigm was required."

The situation hadn't improved by 2007, with witnesses naming the defendants in police sex trials in breach of long-established rules about informing jurors of a defendant's previous convictions prior to judgment and the naming of an alleged murderer on-line before he had even come to court. InternetNZ continued to be concerned and planned a seminar and ongoing discussion on how to approach the subject.

"It was a relief to be able to concentrate on the kinds of real issues that had attracted most members to the Internet Society, rather than arguing about the best type of registry. We soon began to make a useful contribution to the national policy debate. For me it was a lesson in the power of participatory democracy, and the ability of the technology community to raise issues and to provide a forum for resolution. In the end, we maintained our corporate ideals, and proved the strength and effectiveness of industry-led, self regulation. In many ways, we demonstrated the viability of continued private sector leadership of the governance of the Internet," said Dengate Thrush.

END OF AN ERA

The Patrick O'Brien defamation case against Alan Brown continued to bubble under the surface but even that couldn't keep the irrepressible Brown's tirades in on-line forums. He was suspended from using the ISOCNZ members' mailing list in April 2000. Dengate Thrush was one of a number of people concerned about the quality of debate on the ISOCNZ members' mailing list. "In my experience as a professional it was a great deterrent to being a member of ISOCNZ. The volume and quality of what was being posted in the end prohibited useful debate. It was dominated by people who obviously spent all day in front of their screens, and we were grappling with what were

effectively bullying, flooding and flaming on the list. Sue Leader had written acceptable use policies for the list but they weren't being observed so I decided we should have a moderator or sheriff. I think the first person I appointed was David Zanetti; as a result the volume of traffic on the list went down and the quality of debate went up."

Warnings about content didn't deter Brown. He was suspended from the ISOCNZ members' mailing list for two weeks when executive director Sue Leader found comments he had made about Domainz's PR company breached the acceptable use policy. He then gained access to the list using Leader's email address to post insults about her. The ISOCNZ council, in a bid "to raise standards for communication on the Internet"[9] extended Brown's ban to the members' list and the public ISOCNZ-l list to four weeks. A decision to remove the gateway between the list and the nz.isocnz.org newsgroup to prevent him posting again infuriated many in the Internet community.[8]

In August 2000 Peter Mott was again on the attack. He threatened High Court action against ISOCNZ, alleging it had a deliberate policy of urging his customers to change to other providers. He claimed to have written evidence from a Domainz employee that his company '2Day had specifically requested not to be considered as a dot.nz name service provider.' Mott denied this. "We asked not to be referred to as a registrar on the Domainz web site, because we are an ICANN registrar and the Domainz use of the word is completely different to the ICANN meaning." The term 'registrar' had since been replaced with 'domain name service provider,' which Mott said adequately described his service. He was frustrated that his ISP was still not listed in the drop-down box on Domainz's web site 'despite trying to resolve the issue for ages.' Some ISOCNZ councillors were angered at evidence of such claims. There had been an attempt to have chief executive Patrick O'Brien remedy the matter.[10]

Patrick O'Brien certainly left a legacy, but in many people's minds it was mired by the public face he presented when playing hardball and sorting out business and legal issues that stood in the way of Domainz and its goals. "Someone once said that as CEO of Domainz, there was no need to wear a suit. All you had to do was open up the email, and a 'suit' would be waiting pretty much every day. I guess that might have been a fair take on the changing legal and commercial environment then but life wasn't just about defamation," said O'Brien.

There were the stoushes with the Commerce Commission, the Privacy Commissioner, the Office of Fair Trading, trademark and copyright issues, court cases of domain name hijacking and domain name ownership, international governance issues, and of course the creation of a highly successful and profitable business, which was to leave ISOCNZ cash rich and able to become far more involved as an Internet activist. O'Brien left Domainz at the end of September 2000. The time was right to move on as 'commercialisation of the registry has certainly been successfully achieved and the company is now entering a new era with a new focus.'

In a Computerworld article 'Domainz CEO walks,' Russell Brown said O'Brien had been increasingly embattled, especially since his friend and supporter Jim Higgins stepped down as ISOCNZ Council chairman. Domainz' relations with other industry players had been strained, especially over the new $700,000 registry system introduced in 2000 and the Domainz 'accredited registrar' contracts, which many ISPs had refused to sign.

2Day.com managing director Peter Mott, who had frequently been at odds with O'Brien, was quick to applaud his departure. "As a monopoly supplier to a young and innovative industry, Domainz has regretfully brought complexity, confusion, and frustration to a market that has been screaming for simplicity," said Mott. The CEO's future appears to have been discussed at consecutive meetings of both the Domainz board and the ISOCNZ council on 24 August, after Mott made his complaint about his listing being ignored. Mott said O'Brien's departure should not delay progress to a competitive domain name registration mode. Acting Domainz board chairman Robert Gray said the company was 'ready to move to its next phase of development' on the basis of the Hine report.[11]

O'BRIEN WINS DEFAMATION DAMAGES

The case against Alan Brown of Manawatu Internet Services, for allegedly making defamatory remarks about Domainz CEO Patrick O'Brien on an Internet newsgroup was finally heard on 3 May 2000 in the Palmerston North District Court.

It took until September 2001 for judgment to be issued in the landmark defamation case. Judge Gregory Ross awarded O'Brien $30,000 general damages and $12,000 punitive damages. O'Brien's lawyer, Peter McKnight of Wellington company Izard Weston, said the damages awarded were high and he was pleased with the outcome of the case. The judgment was decisive: defamation laws do indeed apply to cyberspace in New Zealand.

O'Brien had sought general damages of $85,000 and punitive damages of $55,000.

ISOCNZ chairman Keith Davidson agreed the decision could affect freedom of speech on local Internet newsgroups. "It's hard to see that it won't have some impact," he said. Alan Brown, who conducted his own defence, refused to comment.[12] Domainz made a contribution of several thousand dollars towards the fees of the defendant as well as covering all of O'Brien's court costs. After all O'Brien was standing as plaintiff on behalf of his old company.

Judge Ross said Brown had failed to show his comments came from an honestly held belief that they were true; they were more of a personal attack. Brown claimed the legal defence of fair comment, but the judge said fair comment was based on an informed argument and Brown had made no attempt to separate fact and opinion. The judge was unimpressed by the fact that when Brown was offered the chance to apologise, he reacted by making further defamatory allegations, claiming a key motivator behind Brown was the financial welfare of his ISP. The judge said of comments made on the Internet: "I must say I know of no forum in which an individual citizen has the freedom to say what he likes and in any manner he wishes about another individual citizen with immunity from suits for all consequences." And so he made sure there wasn't.[13]

The outcome of the defamation case came on top of two lawsuits brought by Telecom and Actrix, who sought to curtail Brown's activities in another arena. Brown had been running the Open Relay Blocking Service (ORBS) in New Zealand, which had been used around the world for blocking spam. When Brown received complaints that Telecom was forwarding spam through 'open relays'[14] he notified them but they failed to respond. The policy of ORBS was that if you didn't take action when notified of a complaint, after a certain number of days you went into blocking mode. Brown subsequently blocked all Telecom's subnets. Actrix was similarly blocked.

According to the Internet Anti-defamation League[15], Brown took over ORBS.org after it was kicked out of Canada. 'Brown used ORBS for revenge against ISPs that he didn't like, even though they did not operate open relays. He then used the ORBS blacklist to block anyone who displeased him – reasons that frequently had nothing to do with spam … Brown moved on to SPEWS and SORBS.net.' A High Court judge in Palmerston North issued an injunction. When Brown failed to remove the two ISPs from his blacklist, he was threatened with arrest. He subsequently made a formal apology

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and accepted the companies should not be on the list. Brown had made a large number of enemies in recent years due to his blunt personality. Many disagreed with the policies he introduced into ORBS, and a web site was even set up to enable people to vent their spleen, at www.stoporbs.org.[16]

Brown admitted he was in financial trouble after Xtra and Actrix took him to court, claiming they had been falsely added to ORBS's blacklist. In the wake of both court cases Brown sold Manawatu Internet Services to Quicksilver and shut down the anti-spam company ORBS. In an email to users of his former company he announced the sale and said stress associated with running the business had taken a toll on his health. Being taken to court a second time within a year was just too much, so Brown skipped the country.

Robert Hunt director of Plain Communications in Christchurch said there was a likeable side to Alan Brown who, in the formative days of the Internet in New Zealand, made every effort to be helpful to people, particularly those in the technical community who needed advice. "He'd sit on IRC and answer people's questions on how to set up Linux and all that sort of stuff. However he just wasn't from the same world as the corporate swarm from Telecom." He claimed Brown's angst about how Domainz was run was based on genuine concern.

PREPARING FOR A MAKEOVER

The final version of the Hine Report was presented to the ISOCNZ Council on 20 October 2000 and became a template for revising how domain names were handled in New Zealand. It said a lightweight registry was needed that involved registrars who were roughly congruent with ISPs, registering names, largely mechanically, without involvement from the registry and paying relatively low fees, said former Victoria University domain name manager Don Stokes. The SRS would help distance Domainz from ISOCNZ, reposition it as a wholesaler of domain name services, put an end to claims of a perceived conflict of interest, and gear the operation for the sale of Domainz as a registrar.

There was a strong feeling amongst ISOCNZ members and the .nz community in general that the new registry should have a slim-line operational model for the ongoing management of the SRS and DNS, including a simple billing arrangement with registrars. This was often described as the 'two geeks and a pager' model and, although not adopted as a formal requirement, was an unstated goal that loosely defined the parameters of the technical solution.[17]

The month the report was published, Domainz was supporting about 74,500 registered domain names, and while it had been encouraging other businesses to register domains it remained the registry's fifth largest customer. The Hine Report suggested Domainz should present the same registry interface to all registrars including itself and said its present role as registry and registrar was perceived to be creating a conflict of interest with other registrars. Customers were often confused by the billing cycle and unsolicited messages from Domainz. While Domainz provided an excellent service to registrants, its customer focus was 'wholly inappropriate' and inhibited the development of alternative services some registrars would like to offer. It also confused registrants about who was responsible for resolving particular problems.

Following 'broad-based comment and complaint' about Domainz's lack of consultation, particularly on technical interfaces, the report noted that Domainz was not perceived as operating

according to ISOCNZ's values, which required the registry to operate 'in a co-operative fashion to facilitate the operation and development of the Internet in New Zealand, and should not abuse its monopoly status.' It recommended the market for services relating to domain names be made open and competitive with no significant barriers to the entry of new services. Policy should be altered to remove the registration function from the registry, so it could focus on registrars as its customers. This would create more of a level playing field, foster competition in the registrar market, and lead to a greater range of services and options for registrars. All of this would simplify the role of ISOCNZ, allowing it to focus more clearly on its wider objectives.[18]

Further urgency was given to getting a new system up and running when it became clear that the existing Domainz registry system remained unstable, nearly six months after retiring CEO Patrick O'Brien declared it to be 'working well.' Interim CEO Donna Hiser emailed dot.nz service providers at the end of November 2000, saying a large part of each day was still spent helping customers who were experiencing bugs in the system. "The highest priority for us is to clear those bugs so that your businesses can run smoothly and our attention can focus on longer term improvements.' Advantage Group, the original developer, was committed to achieving this, and she noted her 'considerable frustration with the design of the Domainz Web interface,' promising quick remedies. The published cost of the system to date was $750,000.[19] Hiser was replaced by Derek Locke as Domainz CEO on conclusion of her six-month contract.

Robert Hunt, director of Plain Communications in Christchurch, said there were daily frustrations. "ISPs were trying to set up domains for users and do the real business after they made a sale. The one thing we had to have in the middle was registration of the domain, so the root name servers knew about it. If it didn't work, or there were delays in moving from one company to another, you would have email going astray. That mess went on for years and the amount of business time it wasted is just unthinkable."

The ongoing involvement in managing the dot.nz space through its solely owned subsidiary Domainz continued to take up most of ISOCNZ's time. Despite several reductions in fees for domain names, Domainz had still managed to net its parent company a surplus of half a million dollars in 2000.

THE SHARING MACHINE

The first steps in preparing the business case for the SRS were completed in October 2000. Then five months later an Implementation Oversight Committee (IOC) was established under Bob Gray, an ISOCNZ councilor and chairman of the Domainz board, as a steering group for the project. External consultant and implementation manager Rose Percival began discussions with the dot.nz industry, and turning the recommendations of the Hine Report into workable business processes.

External consultant Doug Mercer was appointed to manage the technical implementation. A request for information was put to the market on 29 October for a partner to develop a prototype and prove the 'suitability, integrity, performance, and reliability of the proposed architecture,' then develop the application. In all 51 companies responded, 17 made formal responses, and this was narrowed down to a shortlist of four. Catalyst IT,[20] Optimation, Sytec, and Zivo were invited to make proposals on 23 November. Sytec, withdrew and the contract went to Catalyst IT. The technical work on the SRS began on 3 September 2001, and the budget for it was approved by the ISOCNZ council in December.

In May 2001 the ISOCNZ rebranded itself as InternetNZ, partly to give it a fresh face following the recent high-profile legal and internal issues, and partly to eliminate any thought

that it was a local chapter of the international ISOC. There had often been confusion when local representatives, who were contributing to important decisions about the future of the Internet, went to international meetings. Being mistaken as an affiliate of ISOC was becoming embarrassing. Pressure from Sue Leader and Peter Dengate Thrush to change the name had been coming for a couple of years, but it had never made it to the agenda before.

Meanwhile the number of registered dot.nz domains stretched out to 100,000 as Kapiti Signs owner Lance Patching registered the name kaptisigns.co.nz, winning a mystery weekend holiday for two for his timely effort. New Domainz CEO Derek Locke said New Zealand now had the fifth highest number of registered domains per million of population in the world, with registrations growing at about 4000 a month. The non-profit organisation was run by 20 elected councillors voted on by its membership, which was open to anyone who could pay the $50 annual fee. In July 2001 the society consisted of only 400 members, a tiny portion of the million or so New Zealanders who now used the Internet.

While the main media focus seemed to be on ISOCNZ's internal troubles, a perception easily deduced by the invective charged debates, on the various Internet community newsgroups, members of the committee continued to put endless hours into more constructive pursuits. Every issue that had some long-term impact on the future of a 'free and uncapturable' Internet in New Zealand required careful consideration, and after a fully democratic process of open discussion, submissions representing the Internet community were made to inform decision-making groups.

With a number of laws and telecommunications issues which were of immense importance to the future health of the Internet community being revised, ISOCNZ had its work cut out for it. It couldn't claim to represent the industry without full consultation and research that would enable its submissions to be considered expert. The group was clearly beginning to have some clout as many of its position statements began to form the basis of changes in our laws and how the telecommunications environment should evolve.

In February 2001 Ewan McNeil, Rick Shera, and Sue Leader made a submission on the Crimes Amendment Bill.[21] In September Keith Davidson submitted a position paper on the Telecommunications Bill.[22] In January 2002 a submission by Rick Shera and Sue Leader on the Consumer Protection Bill[23] and in October Shera, Stephen Bell, and Leader made the ISOCNZ's position known on the Inquiry into the Operation of Films Act.[24] InternetNZ was increasingly perceived as having a powerful voice as a lobby group, influencing public opinion and government policy. It was involved in education of users on issues such as safety and security, and fair play between ISPs.

Newly elected chairman Keith Davidson, at the time general manager of Wairarapa Internet access provider Wize.net and the *Wairarapa Times Age* newspaper, hoped proposed changes to the way the Domainz registry was run would open up a new chapter in the workings of the society. Under the proposed changes the .nzRegistry would be operated by an InternetNZ-owned body known as the New Zealand Domain Registry, and Domainz would be spun off and prepared for sale.[25] The InternetNZ council had agreed at its December 2001 meeting that Domainz would act as a 'stabilising registrar' in the interim.

In February 2002 InternetNZ began advertising for its first domain name commissioner, to oversee the operation of the dot.nz namespace, during and after the transition to the new system. This person would be the only privately appointed regulator in the world, responsible for managing the contractual relationship between the domain name registrar, the registrant, and the registry. Other countries were still grappling with this role, many relegating it to governments, but the New Zealand's model was soon attracting considerable attention.

Work on the new million-dollar-plus software package was underway and tenders were out for a new accounting and billing system as part of the registry system replacement. The development would be done in small, manageable increments to avoid the embarrassing problems that had bogged down the previous system.[26] The first stages of the SRS were implemented on 14 October 2002, with Domainz as the sole registrar. The project budget was $1.095 million; it was completed on time and $171,012 under budget. In the days following implementation, a number of migration issues were uncovered but this was considered small in proportion to the number of domain names involved, which was approaching 120,000.

Technical manager, Doug Mercer, said the process of implementing the SRS had been complicated through the legacy of tension that had developed in the InternetNZ community, largely relating to the earlier implementation of the DRS by Domainz:

There were 175 domains with non-English characters, 9 domains with extraneous characters, 3 domains with missing IP addresses, 1 domain with no name server, 160 domains with duplicate name servers, 10 domains overdue for renewal, and 431 cancelled domains showing as active. All the issues were related to data quality and the processing of domains by the DRS. Some of the issues had been picked up in migration testing but could not be amended in time by Domainz and some were unexpected anomalies. These issues did not represent a threat to the ongoing operation of the register. Although not perfect, the migration can be considered very successful in the circumstances, particularly given the number of data quality issues uncovered during migration testing and the legacy of poor quality data inherited by the DRS from the earlier Waikato University system.

From the point of view of the technical project, the greatest impact was on the sometimes strained relationships with parties that needed to buy into the SRS development and the perception that obstacles were being created where co-operation was preferred. On more than one occasion the implementation schedule was put at risk, mainly due to delays in gaining key decisions from the InternetNZ Council that impacted upon the technical project. An example of an apparent conflict was the relationship with Domainz. At an operational level Domainz co-operated fully with the SRS project team and a good working relationship was established from the CEO down. The project could not have succeeded without the efforts of Domainz staff. A perception developed, however, that the Domainz board did not share the same vision for the shape of the SRS business environment as that held by the implementation team and InternetNZ.

It would not have been surprising if Domainz board members had viewed the establishment of a new registry company as akin to a hostile takeover and, given the public stance of some InternetNZ councillors, they may have had good reason to do so. As would be expected, when Domainz board members who where also InternetNZ councillors represented the interests of Domainz in Council, they often appeared to be add odds with the interests of the SRS implementation. An example of this unenviable situation is when the chair of the IOC felt compelled to resign, apparently due to irreconcilable differences between the Council's intentions for the SRS and the perceived best interests of Domainz, of which he was also board chairman. Many of the conflicts and issues that arose in relation to the governance of the project could have been predicted from the outset. A conflict of roles clearly existed in more than one situation, regardless of the personalities who fulfilled those roles. The pre-existing tensions surrounding .nz merely heightened the differences.[27]

The SRS was now open to competing registrars and according to newly appointed domain name commissioner, Debbie Monahan, the launch went with barely a hiccup. The SRS would form the core of a new regime for domain name registrations, allowing all registrars to add and change names directly in the register itself rather than through Domainz. The DRS would continue to run in parallel as a back-up in case anything went wrong. The new system would be rolled out in stages, finally taking over fully on 7 December 2002.

Debbie Monaghan, Domain Name commissioner.

DOMAINZ ON THE BLOCK

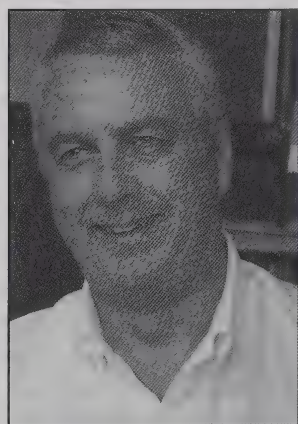
On 6 June 2003, as the dust was settling, hopes were high that the Domainz registrar business would soon be sold off. Ironically Monaghan was then forced to suspend Domainz from trading for 48 hours. The sanction she said was not as punitive as it might have been, because of 'mitigating circumstances.'

Monaghan had been in the job just over a year, and until the SRS and its policies and procedures kicked in, she literally had no authority. After the first stage of the SRS went live on 14 October 2002 an agreement was put in place between Domainz, InternetNZ, and the new registry company, that Domainz would now begin its year-long role as a stabilising registrar. Domainz, still registrar for all the dot.nz domain names, was to transfer these according to set policies and procedures, as new registrars were authorised.

Domainz had, however, got into the habit of taking payment for names but only validating them for a month until the cheque, credit card, or invoice had cleared, regardless of whether registration was for one month or 120 months. Once the funds came through it would update the .nzRegistry for the appropriate period. That adjustment wasn't being made fast enough and resulted in great confusion. "As people transferred away to different registrars some customers were being told they needed to renew their domain name registration as it was only for one month. To the customers it looked like the new registrars were wrong but it was Domainz," said Monaghan.

A significant number of registrars faced problems, so Domainz had to go back through its systems, put things right, and compensate registrars who had paid again, to ensure the domain names remained active. "We let Domainz stay on the system to maintain their existing names but they couldn't do anything that involved generating new revenue for 48 hours during a normal working week. They also had to display a notice on their web site that they had been sanctioned," she said.

"We acknowledged they had done some good work but they did affect a number of people and consequently had to amend their processes. It also showed the market that the new rules were going to be enforced and that people needed to be compliant. We said we would operate fairly and independently of InternetNZ, even though we were one of their operating companies.' The news of the sanction came on the same day that it was announced Domainz was for sale.



Peter Macaulay, founder of No. 1 Software, former ITANZ president, Digital Strategy head, and (current 2008) InternetNZ president. Photo: Randal Jackson for CIO magazine.

NASA BACK-UP SHUTS DOWN

Concurrent with the new system going live, with a competitive market operating for domain name registration in New Zealand, InternetNZ announced another milestone had been passed. NASA had subsidised the US gateway Internet link to Waikato University in 1989. While NASA had stopped its subsidies for the bandwidth back in 1994, it had continued to provide back-up servers at no charge.

In a media release on 19 December 2002 InternetNZ president Keith Davidson acknowledged the "huge debt of gratitude" to NASA, saying the relationship with New Zealand was "a classic example of the co-operative way the global Internet developed." He said the Internet in New Zealand had changed beyond recognition since that initial connection.

Meanwhile InternetNZ had worked steadily to bring the New Zealand domain name space onto a more formal footing in response to the development of the Internet as critical infrastructure for the country. "This meant InternetNZ had to move away from the original voluntary relationships, such as that with NASA, and into more commercial and contractually based services." As part of the PACCOM consortium, NASA provided a name server located at the Ames Research Centre in California to assist with the domain name service for the dot.nz top level domain from 1989, in case name servers within New Zealand became unreachable.

In November 2002 the New Zealand DNS operator, .nz Registry Services, had contracted California based UltraDNS Corporation to provide international DNS services. This would provide multiple points of presence, placing New Zealand DNS data close to users of New Zealand domain names throughout the world, and greatly enhancing the New Zealand DNS performance for non-New Zealand users. National DNS services were provided by five name servers within New Zealand.

For executive director, Sue Leader, InternetNZ had worked through the major developmental issues and was now well positioned to move into a consolidation phase. It was time to move on. She worked a three-month extension to her final contract while a new executive director was sought.

As head of the ITANZ, Peter Macaulay was aware of the difficulties and dramas surrounding domain management and had turned down an offer to mediate. "I looked at the people involved and thought, 'Trying to fix this would be like trying to separate two fighting Irishmen; they will stop fighting long enough to beat you to a pulp and then go back to their own fight.'" Besides, he knew most of the people involved and there was good and bad on both sides in his view. "Altruism was being mistaken for failure to plan and failure to plan was being mistaken as altruism."

Macaulay had been working in England during the big dust-up when former committee members at the ISOC were ousted. On his return in 2002 he became its new chief executive. The first task in his 18-month contract was to sell Domainz. Fortunately he had a supportive team with David Farrar, Chris Streatfield, and Keith Davidson, who all had commercial nous and knew how to get things done. He brought in Tim Russell from Deloittes to manage the process. "The main challenge was, how do you take a company which has to shrink in size, drop the amount of business it's got by nearly 30 percent, then sell it for a lot more money?"

The prime consideration, he said was to focus on growing the entire market. "We were not going to give away the whole pie, only a slice of it. But if we made the pie bigger there would be a lot more for everyone else. The key was developing the business so that our slice was big enough to get some real money, and those left would still be excited to come on board." On 21 August 2003 the final act in the transition to open competition of the dot.nz domain name space was announced. Domainz CEO Derek Locke and his management team had put in their own bid for Domainz, but conceded the company went to Australia registrar Melbourne IT for $1.5 million, more than double the market value.

Melbourne IT was one of the larger registrars in the world, although it was in a similar position to Domainz – a former monopoly registrar moving into a competitive world.[29] Under the new SRS model InternetNZ would no longer own a competing registrar. As of 31 August 2003 30 organisations were authorised as dot.nz registrars and connected to the SRS providing direct dot.nz domain name registration services. A further ten organisations were authorised as registrars, and preparing to connect to the production environment. The sale of Domainz, finalised on Friday 5 September 2003, and the agreement from the Registry to release the SRS source code, marked the end of a long and difficult path to a truly competitive and pro-registrant shared registry service for the dot.nz namespace.

The successor to Dengate Thrush, as president of the society and chairman of the ISOCNZ Council, was Keith Davidson. He wouldn't be drawn on where the money from the sale of Domainz would go but claimed it could be spent several times over on office expenses and running the organisation; besides the SRS had cost the organisation a packet. It was the beginning of a new era and time for InternetNZ to start focusing on the backlog of Internet governance issues that had built up. "Those early council meetings were about 90 percent on dot.nz and 10 percent on everything else; certainly while we were getting the SRS model right, and the right people and level of reporting in place. It wasn't until about 2004-2005 that it swung the other way where we could spend only 10 percent of our time on dot.nz matters, and the balance on the broader objectives of the society."

InternetNZ AS GUARDIAN

InternetNZ began to review its own goals and strategies. As the Internet continued to grow exponentially there were no shortage of opportunities to make good on its self-appointed role as guardian of the Internet in New Zealand.

Apart from continuing to represent the New Zealand on global Internet organisations as the delegation for the dot.nz top level domain ccTLD, it was there to foster 'co-ordinated and co-operative development,' to 'promote and protect' and ensure the Internet in New Zealand operated in an open and uncapturable environment. Its membership now embraced ISPs, Web designers, academics, public information groups, and Internet users. It could increasingly operate as a body that educated and provided commentary and research to politicians, industry influencers, and the media.

From 2003 it became far more active as a lobby group attempting to gain industry consensus and removing any obstacles to the growth and wider use of the Internet, including ongoing work on a wide-ranging code of practice for ISPs. Issues such as improving the security of the domain system, preparing the country for the transition from IPv4 to IPv6, establishing a Research Fellowship for Cyberlaw with Victoria University, and making submissions on the government's Digital Strategy were now front of mind.

Macaulay brought a more output-focused business approach. He saw the society's role as facilitator, providing the tools and administration base for groups such as Next Generation Internet

(NGI-NZ), the Internet Advisory Group and working towards closer relationships with the Network Operators Group (NZNOG), the Computer Society, and others. InternetNZ moved into larger premises, with all three of its units now at the same address.

In his 2004 executive director's report Macaulay quipped that one day there would be as much need for an Internet Society as there is for a Telephone Society. "But don't expect it soon, especially in New Zealand which is plodding towards true ubiquity, steadily but slower than most similarly placed countries … We have our headlights on full beam and a good piece of the road ahead is visible, although we are not free of bumps … It is our time to become more assertive in demanding that our industry and our government lift their game, and deliver fibre and affordable connections to every home."[30]

He began scanning the world for next generation filtering technology to reduce spam and porn and monitor rogue ISPs. He was looking into ways to improve on the 1999 ISP Draft Code of Practice, being worked out in conjunction with ISPs and other stakeholders, including the Consumer's Institute, the Direct Marketing Association and Advertising Standards Authority and administered by the 12-member advisory group. "We want something easy to understand, not like the Australian Internet code of practice, which is 30 pages long and reads more like an Act of Parliament. ISPs will find it increasingly hard to get customers if they are not a signatory and the advisory group will have the ability to revoke their registration if there are breaches of conduct," said Macaulay in *Telecommunications Review.*

In his final year as chief executive Macaulay talked of the importance of maintaining strong relationships with government, the various communities of interest, and the ICT industry. "The key thing was to eliminate the perception that the society was a bunch of amateurs dashing around beating their heads against things." By the end of 2005 InternetNZ was deeply engaged in consulting with the Commerce Commission on unbundling the local loop and a review of the Telecommunications Act as part of the government's telecommunications stock take, with a professional team fronted by lawyer Michael Wigley. The society gained further credibility through its support for the Internet Safety Group. "Along with good management of the domain name, and a track record of having representatives including Peter Dengate Thrush on ICANN, people began to see the Internet in New Zealand was in safe hands."

It was never expected that the role of steering the New Zealand Internet into the future would involve such a painful cultural, technical, and administrative transition. Stepping back with a healthy budget, a lightened workload, and fresh faces on board the way was clear for some new thinking. InternetNZ was now well on track to becoming the kind of organisation it had wanted to be all along.

Defending the code

ICANN is requiring registries to agree to a very onerous contract which includes provisions that will stifle small business, individual, and free speech interests. Worse yet, they are doing this without consensus of the Internet community, without a membership in place (which was supposed to be the Interim Board's first task), and without appropriate representation for individuals and others.

Mikki Barry, president of the Domain Name Rights Coalition and member of the Boston Working Group, July 1999

In the middle of 1997, the US Government began seeking input into the management of the domain name space amidst concerns from trading partners that the Internet was too US-centric. After all the Internet was now a global phenomenon and many nations were increasingly dependent on it for their economic well-being.

Back in 1992 NSI had made a smart move when it won the contract with the NSF to develop the domain name registration service. The next year it was granted an exclusive contract to be the sole domain name registrar for dot.com, dot.net, and dot.org TLD names. No one at the time had any inkling, that with the arrival of the Mosaic browser and the phenomenal growth of the World Wide Web, dot.com would become the preferred domain for commercial business. In 1995 when NSF granted it authority to begin charging US$100 for two years' registration.NSI began turning over millions of dollars, which many believed was excessive, particularly as it had a monopoly position in the market.

The lucrative contract for the dot.com commercial domain, which was increasingly used by New Zealand companies, was about to expire. On the table was a new system and the transition to a more competitive shared (SRS) marketplace with rules and policies of governance. The role of NSI, which had revenues of US$45 million in 1997 through regulating the dot.com addresses, was about to change. With the obvious growth curve in Internet uptake it was also clear that IANA, a US Government contract run by Dr Jon Postel, would also need to be reviewed. The first attempt at a replacement body occurred in 1994 when Postel attempted to place IANA under the ISOC.

ISOC and its industry allies tried again to take control of the high-level domain name processes and Internet governance through the International Ad Hoc Committee (IAHC). It proposed through the Generic Top level Domains – Memorandum of Understanding (gTLD-MOU) to create 50 new registries, hosting three new TLDs each, and appoint additional registrars managing the resulting 150 new names. This process would have involved some control shifting to the International Telecommunications Union (ITU) in Geneva.

Roger Hicks, who had been the ISOCNZ inaugural chairman, alerted the Council of the issues brewing at international level which could have a serious impact on the running of the New Zealand country code. He raised concerns about the work being done by the IAHC on generic domains and challenged its right to represent the Internet community. While the system of delegation put in place by Jon Postel and IANA wasn't likely to change, the central role of IANA, and the ISOC in Internet governance was being examined. Both the ITU and the WIPO were taking a strong interest, particularly in the DNS, believing there should be a strong tie between domain names and trademarks.

Hicks was particularly concerned at the lack of representation for New Zealand on decision-making committees and the fact domain names were being so closely associated with trademarks. There was no international trademark law, so trademarks needed to be registered separately for every applicable jurisdiction. That in itself presented a huge problem for most country code managers, like New Zealand. An international agreement could easily be overridden by local law, leading to conflicts with country registries. There was also a possibility of a split in the DNS, with some new domains not being recognised in some jurisdictions. And there were suggestions that disputes over trademarks be handled by the WIPO, which further set off alarm bells for New Zealand.

These issues were up for discussion at the NSI meeting in April 1998 where the contract for administration of the existing TLDs was to be renegotiated. ISOCNZ began looking at ways to put its case and ensure its voice was heard in these important discussions on the future of the Internet. Roger Hicks was a member of the APIA, representing a group of heavyweight commercial concerns in the region. It had gained NGO status on the ITU and was concerned that under the WIPO it could take 30–60 days to register a domain name, in order to allow objections to be raised over potential trademark conflicts. It was opposed to the move so Hicks offered to act as a liaison between APIA and ISOCNZ and report on progress.

FIGHTING FOR THE FUTURE

It was clear that if e-commerce, for example, were to flourish, a stable, predicable Internet environment with a clear distinction between trademarks and domain names was needed. There were concerns at the lack of consultation in the way the IAHC had been set up, the large cost involved in establishing a registry, and the overall issue of accountability for running the Internet, including quality of service issues. In all of this the small country code managers seemed to be railroaded, almost as if their views didn't count.

Domainz chief executive Patrick O'Brien saw common issues plaguing other national registries and believed it would be useful to have a regional contact group. If such a commercial arrangement could be put in place Domainz might be able to support Pacific Island and other regional domains. ISOCNZ councillor Andy Linton was particularly interested in the issue as he was the technical contact for six Pacific Islands registries as well as Nepal.[31]

The IAHC had its ambitions curbed when a US Government greenpaper issued in January 1998 sought wider discussion on core Internet governance issues. In the follow-up whitepaper in April, US policy was set out regarding privatisation of, among other things, the domain name system, suggesting 'a global industry-led, government-free, self-regulating not-for profit' entity be established to manage and co-ordinate policy for allocating blocks of IP addresses to regional registries. It would also oversee the Internet Root Server system, policies for creating new domains, and co-ordinate Internet technical parameters.

Debate continued over the possible outcomes once US Government funding for IANA ceased, the overarching possibility being that if the various meetings couldn't agree, the US Commerce Department might follow through with its threats to create the necessary infrastructure itself. The whitepaper was discussed in meetings around the world in the International Forum on the Whitepaper (IFWP), which brought all the country code managers, address registry managers, governments, and civil society together for the first time to grapple with the issue of a global governance structure for the Internet. A series of five meetings were held. WIPO was concurrently conducting its global circuit of discussions seeking support for its recommendations on trademark and domain name dispute resolutions. New Zealand made submissions at the Sydney meeting, defending its position that domain names should not be related to trademarks in any way, and that dispute resolution should be up to each country to sort out themselves.

Patrick O'Brien and ISOCNZ chairman Jim Higgins attended both the Geneva[32] and Singapore meetings where the devolution of IANA was being discussed. They put forward the New Zealand experience and the actual working model devised by ISOCNZ as a possible solution. The submission was well received, giving New Zealand a relatively high profile at the meetings and within the wider Internet community. The Asia-Pacific Regional ccTLD was established with Korea in the chair. However the World Wide Alliance of Top Level Domains (wwTLD) group was also formed, and despite opposition, including from New Zealand, decided to exclude NSI. The issue then became who the stakeholders were, how voting would work and how the new stakeholders in Internet governance would be represented. The next meeting in Boston would be the clincher.[33]

COUNTRY CODE CHALLENGE

Towards the end of 1998, after the round of meetings had concluded, Jon Postel and several others submitted a draft constitution and bylaws for the private sector entity called for in the whitepaper. Peter Dengate Thrush and Patrick O'Brien, on behalf of ISOCNZ and Domainz, had made submissions to the US Government as part of the Boston Working Group (BWG) in late 1998. They wanted to ensure the protection of New Zealand's authority for the dot.nz country code, clarify the distinction

between trademarks and domains, and gain a greater role in decision making for country code managers. While the various bodies involved in governance were looking to build an industry-level government free organisation, NSI's monopoly continued to be a major point of contention. Getting everyone to agree on how a new non-profit organisation would take over proved a headache.

"People were trying to grapple with the various issues, and the debate often became very heated. Dozens of people thought they were going to become registrars and each different group was insistent on raising the issues relating to their own particular problems. The country code managers wanted confirmation and security about their roles, address registries were concerned about their allocation of IP addresses and, governments were wondering what their proper role was going to be in this new global structure," said Dengate Thrush.

The debate eventually resulted in the formation of the ICANN, which had the job of placing Internet governance at arm's length from the US and any other government. The NTIA, the advisory agency on IT&C to the US Department of Commerce, ultimately contracted ICANN to administer the DNS and deliver partial competition. Many of the core members of the first two attempts at achieving a governance group were heavily involved in ICANN, including the ISOC, the IAB, the Policy Oversight Committee (POC), WIPO, and the ITU; in the view of some, this determined group had in fact succeeded in 'capturing' the roles it initially sought.

The new body, operating from Marina del Ray in California as a non-profit corporation under Californian law, made its first priority to break the dot.com monopoly. It was eventually successful in transferring the US Government contract with NSI to itself. ICANN installed an SRS and introduced competitive registrars. Under the new arrangement NSI retained its monopoly on dot.com, dot.net, and dot.org but had to recognise a separation of registry and registrar, where accredited registrars would all have access to the data in the registry, in itself a fundamental shift. From the previous position of a single registrar doing everything, there were now multiple registrars. ICANN also adopted the WIPO recommendations on trademark and domain name clashes into the Uniform Dispute Resolution Process (UDRM), a compulsory arbitration process.

JUMPING THE GUN

There was widespread alarm when it became clear that this newly formed body was already making important policy decisions even before its own structures were fully in place. It seemed to some within the Internet community that the future of the Internet was being determined by a small group of interim appointees, not by the wider membership structure as had been originally mandated.

ICANN's collaboration with the WIPO to ratify rules and regulations for country domain names, dispute resolution and copyright and trademark protection remained a source of global concern. No one really knew what might happen. The New Zealand contingency was strongly opposed to having legal and intellectual property disputes settled according to US law. It was also astounded that fees were being proposed along with an assurance of liquid assets of $200,000 before any organisation would be allowed to register gTLDs names.

ICANN was seeking formal agreements with the 13 'root server' operators, the regional Internet registries, including the groups that handled the regional IP numbering scheme such as APNIC; the operators of gTLD such as dot.com, dot.net, and dot.org (later dot.biz and dot.info) and the 240 or so ccTLD, including dot.nz.

However in its attempt to establish contracts with the country code managers ICANN had made a major mistake. It assumed all country code registries were for profit and modelled on NSI and tried to roll out the same kind of contract. "We had to fight long and hard, and engaged in a lot

of educating along the way, to establish that we were responsible to our local Internet community, our national government and local laws. We were not going to be governed from the US," said Dengate Thrush.

All this rush of activity that seemed to be assuming the support of the wider community was getting up the nose of many country code managers, resulting in a growing support for regional representation. The Australian Government was outspoken in its bid to have a say on all future developments. The Europeans formed an alliance to ensure they were fully represented as did some Asia-Pacific nations, including New Zealand. Then as the fall-out from the 'virgin birth' of ICANN escalated, it became clear that the representation needed to be from the actual dot.nz manager. In order to ensure there was a mandate from all stakeholders, ISOCNZ chief executive Sue Leader organised the New Zealand Internet Summit in Auckland at the end of April 1999 to consult on the matter and subsequently wrote a position paper.

As ISOCNZ still had little income to cover its involvement, attendance numbers were kept low and prioritised around meetings that directly involved country code issues. In May 1999 ISOCNZ, with backing of the Ministry of Commerce and the mandate from the industry summit, urged ICANN at the Berlin meeting to 'take its hands off' the New Zealand domain name. It claimed the proposed changes would 'affect national sovereignty and impose significant regulatory and financial pressure on the industry here.' Labour's communications spokesperson Marion Hobbs, speaking at the ISOCNZ summit, was concerned the changes might limit New Zealand's ability to compete internationally and raise costs for businesses and private citizens to participate in the Internet.[34]

Then there was the risk that the dot.nz space might be wrested from ISOCNZ control and possibly even pass to the government. ISOCNZ and Domainz chairman Jim Higgins continued to push the New Zealand model as preferable for future management of the Internet. "No one wants to be disenfranchised. The risk is that solutions may be applied across the world and may not be legally or culturally acceptable to some countries." He urged the New Zealand Government to maintain its 'hands-off stance' even if it were offered the rights.

ISOCNZ ON RIGHT FOOT

Technology Minister Maurice Williamson wasn't aware of any significant complaints about how ISOCNZ ran the domain. He said the Internet had developed as fast in New Zealand as anywhere in the world without any great government intervention. However the Ministry of Commerce would continue to monitor development and use of the Internet and report back on issues such as pornography, digital signatures, encryption, trademarks, and intellectual property protection.

The Kiwi contingent, Peter Dengate Thrush, Jim Higgins, and Patrick O'Brien, attended ICANN meetings, representing the dot.nz country code, starting in Singapore in February 1999 and thereafter in Berlin, Santiago, and Los Angeles. Unlike the Domainz representatives, ISOCNZ executive director Sue Leader found herself travelling economy class for the regular 12-hour flights until her airpoints entitled her to the occasional upgrade to business class to attend meetings.

The US whitepaper hardly referred to country code managers and was very US-centric. Those who drafted it later acknowledged they had been largely unaware that many country code managers were private entities, and had been treating them as if they were under the control of national governments, said Dengate Thrush. "They didn't really grasp what was going on until Sue Leader and I participated in all the meetings from Berlin onwards and helped set up the ccTLD managers group within ICANN, where the New Zealand model was held in high regard."

The vocal protests of New Zealand and other nations over the most controversial proposals, including adding new generic domains, and the roles of national governments, were eventually

overturned. It would take a long time for things to settle. Meanwhile Patrick O'Brien, who had also lobbied hard for autonomous country code management, had made himself so familiar with the processes and presented such an endearing picture of the efficiencies and processes back in New Zealand, that he was about to get himself elected to the board of ICANN.

Just as that process was concluding, murmurings back home arose about his role as a paid representative of Domainz not being compatible with such a public policy role. There was also a strong anti-O'Brien faction due to the changes he'd made in running Domainz, including charging for domain names, new business-focused procedures, and a contentious new system to handle domain name registration. Sensing he wasn't going to win whichever way he pushed things, O'Brien backed down from the powerful international role.

However he had warmed to the SRS approach now being operated by NSI, participated in the debate about what to do with the dot.com domain and became convinced that this was the road Domainz needed to travel. His model, however, still kept Domainz as a primary gatekeeper, not only running the registry but also operating in a quasi-registrar capacity, which allowed other people to act as registrars on contract to Domainz.

ISOCNZ remained active and visible in the regional associations including the APTLD managers meetings, which Dengate Thrush chaired for five years. That persistent presence at high-level meetings and the determination of New Zealand to have its say on major issues, allowed Domainz to 'develop enduring relationships' with some of the key parties in the discussion, said O'Brien.[35]

AWKWARD ALLIANCE

In March 2000 security company VeriSign[36] announced its intention to acquire NSI for US$21 billion. The surprise deal united the world's leading provider of Internet domain name registrations, with VeriSign the leading US provider of e-commerce and email security. At that time, NSI had registered more than ten million domain names. VeriSign was working on its proprietary Advanced Transaction Lookup and Signaling (Atlas) DNS platform, which promised to provide roughly 15 times the throughput of the Berkeley Internet Name Domain (BIND) platform that NSI had been using. Five months later, in November 2000, the number of domain names registered by VeriSign had more than doubled to more than 24 million, and it was processing an average of 1.5 billion DNS look-ups daily.

By 2001 InternetNZ could rightly claim that it had been instrumental in drafting some of the best practice guidelines for country domain managers within ICANN.[37] However ICANN was now requiring a three-way contract with the ccTLD operators, itself and the government of the country concerned. ICANN threatened some of these operators by refusing to re-delegate their rights to manage the country codes unless they signed the contract and paid the fee. Japan and Australia agreed; New Zealand remained in stand-off mode. After about five years ICANN finally admitted it may have had the wrong formula.

When he visited New Zealand in 2003 at the invitation of InternetNZ, Vint Cerf, head of the board of ICANN, admitted the effort to come up with a structure for Internet domain administration was 'in turmoil from day one.' He was confident a more constructive attitude now prevailed and was apologetic about how country code managers had been treated.

Democratically minded individuals and bodies insisted on public elections for the senior ICANN positions, but it was more difficult than it seemed. "We didn't clearly know who our constituencies were" and ICANN faced the prospect of "expending a lot of resource to produce a not-very-good result," he said.

Some national constituencies, such as the Germans, were more energetic than others. Cerf said it was becoming a circus, when the goal was simply to make the domain name system work. He

said the multiple-registry system had its drawbacks, threatening to introduce inconsistency of service and a needlessly competitive atmosphere between national and international TLDs trying to attract customers.

Since ICANN didn't have the power of a government or international regulatory body, it was thought contracts were the best way of ensuring consistent performance. However ccTLDs had predominantly resisted the contracts ICANN attempted to make them sign.

The only alternative is for a ccTLD to devise its own well-defined "code of practice," he says. "Having something written down means there's something to refer to," in the event of a failure or dispute. One of the bugbears in the contractual arrangement for InternetNZ and other ccTLD administrations was ICANN's insistence on access to ccTLDs' zone files – the databases used to translate domain names to IP addresses. Though well-intentioned "that was basically a stupid mistake," Cerf says. "We just wanted to make sure everything was well structured." ICANN and the national administrators are now getting together on a more positive basis to ensure consistent practice and quality with such data.[38]

Ironically it took until 2004, four years after the initial request to ICANN to delete Waikato University as the technical contact for dot.nz and replace it with InternetNZ. ICANN had maintained the shift from Waikato constituted a redelegation and therefore required a new contract. "This was part of deliberate pressure to try and force dot.nz to sign a contract," said Dengate Thrush. InternetNZ maintained its independent stance and was still questioning whether even the exchange of letters was necessary.

During 2004 ICANN began offering the concept of 'accountability frameworks' to ccTLDs, rather than trying to force contracts on countries. These and the new fees were generally more easily negotiated, but progress remained gradual, and only a handful more country code operators came on board. By 2006 it had pulled back to an 'exchange of letters,' essentially acknowledging each party's right to co-exist. This proved the right formula, with more than 50 operators signing in the following year. As at mid-2007 none of the root server operators or the regional Internet registries had signed contracts with ICANN. A handful of country code operators acquiesced to what one of the New Zealand observers called the 'draconian contracts,' but only under duress.

There remained some contentious examples of ccTLD management. "A guy from Boston got the dot.nu delegations for Niue and while he's been giving money back and providing free Internet, the government has been fighting to get it because they see it as a cash cow. In Tonga it's similar; you can use dot.to for a lot of things, and the same goes with dot.tv for Tuvalu. A bunch of country codes are seen as valuable and lawyers have made a lot of money over this kind of issue," said Jim Higgins. InternetNZ continued to discuss the possibilities of a stronger relationship with ICANN possibly through an exchange of letters rather than a formal contract.[39]

In hindsight Higgins believes the US government didn't really want to let go of the Internet. "There was huge hostility from most of the countries over managing the country codes. Attempts by the ITU to take over administration of the Internet in more recent times had been just as frightening for many people." Under the aegis of the ITU, some members feared the Internet could be dominated by undemocratic governments or hijacked by those who wished to censor it or push their own ideological views.

Peter Dengate Thrush, however, believed the element of control still left in the hands of the US Government's Department of Commerce was relatively minor and symbolic. "People generally participate in ICANN because they believe it will become the management authority for location of Internet resources and the US Government will honour its undertaking to transition management to ICANN control." Currently the United States retains the contract to manage the Internet numbering

administration function and one of the terms of that contract is that any change to the root, the core file of the Internet Root Server hosted by VeriSign, needs to be approved by the US Department of Commerce. It is also responsible for the key IANA files for country codes.

As a member of the ccTLD leadership group Dengate Thrush pushed through a proposal for a new body within ICANN where ccTLD managers could have their own direct representation on the board. This body is now responsible for ruling on who can change a ccTLD manager. The proposal for the ccNSO body was first discussed in 2000 and formed in 2004. At the end of 2004 Dengate Thrush was elected as one of its first directors on the board of ICANN.

He said this greatly enhanced the ability of country code managers to meet within ICANN and discuss their relationship with the body, particularly around requirements for managers, the funding of ICANN, and issues of best practice. "The changing of country code managers is the most sensitive of all, and still requires final approval from the US Department of Commerce. While it has never refused any recommendation by ICANN, its role in the process is still like a red rag to a bull for many countries."

GAC ON TRACK

Fears of conspiracies and unholy alliances continue whenever issues relating to Internet governance are on the international table. There was a time when ICANN's GAC was viewed as a secret clique of political lobbyists trying to infiltrate and manipulate Internet-related policy making.

Frank March, senior telecommunications policy advisor with the MED and the government's official GAC representative, said it's better understood and less feared today. "There has been a lot of resentment around the fact that the GAC has operated on a different basis, and kept its meetings closed so people didn't really know what was going on." The closed sessions in fact had more to do with the sensitivity of the various government representatives about discussions on incomplete policies they didn't want in the public arena. "It got carried away to a ludicrous extent for a time but ICANN is maturing and there's a strong move to open up the meetings to the same level as other ICANN gatherings."

One overarching concern was the debate around the involvement of the ITU. "The ITU has been looking for a role for itself since IPNetworks displaced the old switched circuit networks. The whole telecommunications power base virtually ignored the Internet and then they tried to take it over. There was a great deal of resistance from the Internet community objecting to the involvement of the ITU," said March.

The tension goes back to the 1997 ITU plenipotentiary meeting, when it called a World Summit on the Information Society (WSIS). The first meeting, held in Geneva in 2003, saw a number of issues raised about Internet governance. "The issues are manifold, deep and multifarious but basically come down to a tension between whether national governments should be doing things, whether international organisations should be doing things or whether the open Internet should be left strictly alone and more or less in the private sector. Obviously this affects ICANN and GAC."

There was talk of trying to bring the Internet under the umbrella of the United Nations with the UNCTAD, the ITU, the WIPO, and the International Chamber of Commerce having permanent membership. Even ICANN president Paul Twomey was excluded from a meeting of government representatives, underlining concerns that there was a conspiracy for governments to take a greater control in Internet governance and the management of their own domains. Twomey, as reported by the *New York Times* in a phone interview, said "at ICANN, anybody can attend meetings, appeal decisions or go to ombudsmen, and here I am outside a UN meeting room where diplomats – most

of whom know little about the technical aspects – are deciding in a closed forum how 750 million people should reach the Internet. I am not amused."[40]

Caught up in the mix is the fact that the US retains control over changes to the root for the DNS and through the Department of Commerce gives ICANN its legitimacy in terms of running the Internet. The main concern according to March, comes from developing nations in Africa and from the Middle East and Asia. "China, a rising world power on every front is concerned it doesn't have as much acreage in the Internet as it feels is desirable. It's these questions of governance and control that continue to provoke debate, largely because ITU is a governance and control organisation, largely under the auspices of the UN."

March took a leave of absence from his role at the MED in 2005 to become a paid member of the United Nations Working Group on Internet Governance (WGIG), based in Geneva for six months. In the lead-up to the meeting where the findings of the group were to be reported, the *International Herald Tribune* gave an overview of what it described as the 'global tempest' brewing over control of the Internet:

In July 2005, a United Nations task force concluded that US interests could unfairly dominate the global Internet and major changes in governance were needed, but there was no consensus on what to do. The working group's report would provide points for debate in Geneva in September 2005 at the last large-scale conference on the topic before a UN summit meeting on the information age in Tunisia in November.

Australian Paul Twomey, chief executive of ICANN since 2003, would be in Geneva and Tunis to wave the flag for ICANN's independence. When people talk about the future of the Internet, passions flame and interests collide, and ICANN is often in the middle, a ready target for people who fear American dominance or the potential for political exploitation. "Having to answer to just improving shareholder value would be a delight," Twomey, 44, said, referring to the main job of most chief executives. "It has taken more attention and more personal time than I expected."

Yet he seems uniquely suited to his hybrid role. A former management consultant with McKinsey, he has also directed Australia's information technology policy, a private-public combination that prepared him to write nuanced policy statements, balance a multimillion-dollar budget and understand Internet protocols. That background also helps him work with the many flavors of debate – from the front-room decorum of diplomats and politicians, who then hammer things out in the corridors, to the strident, auditorium arm-waving of those with a cause.

Equally important as these qualifications may be another: He is not an American. That lets him carry the banner of neutrality on the topic of US control. Some ministers feel more comfortable confiding frustrations "without feeling constrained that I am the party they are concerned about," he said. His Australian-ness also imbues him with Anglo-Saxon political and business values as well as an understanding of Asia. Having worked for a time in Cambodia and Thailand, he said he could also appreciate the position of the not-so-wired. In the end, most people don't care how the Internet is run, Twomey conceded. They care only that it runs.

ICANN's main job is to manage the addressing system that lets computers on the network find one another. The upcoming debates in Geneva and Tunis (would) center on whether ICANN should be left alone, or disbanded and reconstituted with more global ownership, or absorbed into an existing agency like the UN-run International Telecommunication Union. The Syrians, for instance, want that agency to manage the domain-name system, the World Intellectual Property Organization to resolve ownership issues, and

Unesco to handle content matters. Saudi Arabia has argued for more accountability to governments. India believes it should also take on issues of spam, cyber crime, the digital divide and others – public policy areas that Twomey believes are far afield from ICANN's purview.

The 41 members of the UN working group agreed that ICANN should remain the technical coordinator of the Internet, but left accountability issues to be resolved. It proposed four models without recommending any. Still, the fact that they did not emerge with a political agenda pleases Twomey. "In a UN context, this is not a politicized document, and I think that is a great step forward." Twomey said he believed that ICANN, with its 21-member, international board and eight supporting committees, was fulfilling its "multi-stakeholder" role and ensuring the security and stability of the Internet.[41]

INTERNET UN?

Internet governance continued to dominate conversation at the second WSIS gathering in 2005 at Tunis. While the talk mainly centred on ways to bridge the digital divide between technology-rich and technology-poor countries, ITU secretary general Yoshio Utsumi made the claim that increased 'regionalisation' of the Internet in the near future would mean the ITU would be called upon to take over in five years' time. Again the conference rejected the idea of domination by the ITU and government interests in favour of the present ICANN structure, at least for the present. Utsumi, however, commented: "The Internet need not be one net controlled by one centre ... Regionalisation has already started and I suspect in a few years, the simile of the Internet will be a quite different one."[42]

A further summit was staged in Morocco in 2006 with the core issues outlined in the WGIG Report still unresolved. The ITU Internet Governance Forum (IGF) in Rio de Janeiro in November 2007 was expected to come up with a plan for the next five years, looking at issues that "theoretically were not being looked at by any other body," said March.

Grave suspicion remained about the motives of the ITU. "Although the GAC is being more effective and has taken some of the pressure off, most members remain opposed to the ITU taking a strong role." Those who favoured such a move largely wanted governments to maintain an interest in public policy issues. "It's hard to pin down what the ITU's exact intention is, but for the moment anyway they seem to be more focused on the domain name and IP addressing systems."

The only influence governments had on ICANN and its governance of the Internet at present was through the GAC. There were numerous bodies with input into policy debate around Internet governance. The most prominent were the Internet Society, a private sector international organisation, which had nothing directly to do with ICANN or Internet governance, but was involved in policy development and engaged in assisting developing nations with Internet growth. ISOC gained financial stability when it took over management of the dot.org domain registry from VeriSign.

ICANN itself, March said, had developed a greater understanding about why governments do things the way they do, and had built a strong 'civil society' representation with members from international women's IT organisations, developing countries, and interested parties now making up one third of the seats. This model for relationships was widely adopted and opened the eyes of a number of governments about the level of dialogue that was going on. "People are beginning to appreciate how deep some of the public policies issues are."

Whether the New Zealand Government should apply to take over dot.nz was another issue that remained a possible but unlikely threat to InternetNZ. Some governments had already done this, including South Africa. In Canada the government set up a private sector organisation to run dot.ca; in Australia there was a bit more government control, although a private sector group now

runs the country domain. "InternetNZ is doing a good job but there are definite issues in ensuring dot.nz is run properly. Given that I'm chairing the InternetNZ .nz Oversight Committee it is my job to make sure it is run properly," said March, who insisted this was not a conflict of interest with his government 'day job.'

The only challenge that has come even close to challenging the local Internet governance model came in the wake of the BankDirect phishing scam, when the Reserve Bank sought a review of the process of registering and managing domain names. BankDirect customers were targeted on 26 September 2005 and a month later ASB Bank and BNZ customers were hit with a similar scam, with emails seeking to ascertain customers' personal banking details. In the case of BankDirect, someone had established a bogus web site and was using the bank logo and a message purporting to be an 'anti-fraud notification' redirecting customers to the false site stating: "ERROR(XCF1P1) We were unable to process your recent transactions on your account. To ensure that your account is not suspended, please update your information."

The web site was eventually taken down but no one would acknowledge who had taken the action. This provoked a direct challenge to InternetNZs 'first come, first served' policy, which had been fundamental to its operation since it was formed. A number of organisations suggested the way domain names were registered should be modified and tightened up, and there was ongoing consultation over this. "People often make such statements without digging below the surface. Every member of the Oversight Committee is of the opinion that the parties have failed to think through the consequences of these submissions, but it's clear they have to be taken seriously," said March. The Reserve Bank's observations could be dismissed as being 'largely ignorance' while State Service Commission concerns appeared to largely come from a single individual. "Looking at it from a policy and a services point of view I think InternetNZ is extremely well run, particularly now there's a trademark and domain name dispute resolution framework in place," said March.

RED LIGHT REALTY REJECTED

Meanwhile a bid to create a virtual red light district on the Internet was blocked by a 'coalition of the unwilling,' consisting of unlikely bedfellows: the United States, Australia, and Iran. At ICANN's 25th international meeting, in Wellington in March 2006, more than 700 delegates from 82 countries gathered to discuss a range of issues relating to the Internet's growth, security, and stability and to consider its 2006–2009 'future directions' strategic plan. It expected to take a final vote on creating a dot.xxx top level domain for adult content on-line, an issue which had already been deferred twice previously, when the GAC, unable to reach consensus, decided more work was needed to protect the public interest.

The GAC argued a range of restrictions and protections against illegal and offensive material made in initial undertakings by .xxx's backer, ICM Registry, were absent from the contract the board was proposing to ratify. Several members of the GAC were emphatically opposed from a public policy perspective to the introduction of a .xxx sTLD (sponsored top level domain) including government representatives from the US, Australia, and Iran.

"It's kind of ironic that you've got a kind of coalition of the unwilling here working together to block this thing," said InternetNZ president (2005–2006) Colin Jackson. "We don't have a formal position on the morality of having a .xxx domain. That's not for us to say, but we do believe strongly that if you've got processes, they should be followed, and you shouldn't have governments trying to overturn them or work outside the process." Some commentators, including former European vice-president Elly Plooij-Van Gorsel, in a letter to Britain's *Financial Times*, said this was further evidence of the undue influence the US Government had over the body and would rekindle calls for ICANN to be replaced by a more neutral body.

Jackson hoped pressure wouldn't be renewed for ICANN to relinquish its governance of the Internet. "The alternative is a UN process which is extremely difficult and expensive to navigate and, frankly, has very, very poor accountability." He believed ICANN served the global Internet community reasonably well. "It has an ideal of being an open, transparent, bottom-up, multi-stakeholder body. Unfortunately, I think it has fallen rather short in a couple of things recently. For all its flaws, it's still a lot better than essentially handing over control of the Internet to a large intergovernmental bureaucracy."[43]

Exchange of letters with ICANN. Official recognition of InternetNZ's role as country code manager is cemented 20 years after it took on the role. (Back row Left to Right) InternetNZ President Peter Macaulay, Domain Name Commissioner Debbie Monahan, New Zealand oversight committee (NZOC) chairman Richard Currey. (Front row Left to Right) ICANN Chair Vint Cerf, InternetNZ executive director Keith Davidson, ICANN President Dr Paul Twomey.

Many saw the triple x domain as the ideal place to isolate pornographic content so it could be better managed and policed, and, where appropriate, filtering could be put in place. However the White House opposed anything that might be seen as condoning the porn industry. The other opponent of the move, Australia, claimed it could lead to 'an increase in offensive content' on the Internet, a position supported by Iran. The final statement at the following meeting in Lisbon confirmed governments remained divided on the issue, with some strongly opposed and others seeing it as an issue where ICANN's own policies needed to be followed correctly. The ICANN board by a narrow majority voted against adding the dot.xxx domain to the Root Server.[44]

Two recommendations on how to halt specific denial of service (DoS) attacks were also heard at the Wellington meeting. A third, key issue that didn't make it to the agenda was the acrimonious debate over renewal of a contract with VeriSign. Internet computers interacted with VeriSign millions of times a day to find out how to route email and Web traffic, but some critics considered VeriSign a monopoly that tried to abuse its power by offering services to boost its earnings. Instead of debating the issue in Wellington, ICANN's directors agreed in a telephone conference to continue VeriSign's control of all dotcoms for another six years, until 2012, with a 'presumptive right of renewal.' VeriSign was paid a fixed sum around NZ$9 every time a dotcom domain was registered or renewed. With 32 million dotcoms in existence, the business has been described as one of the most profitable on the Internet, VeriSign having the power to boost its fees by 7 percent each year.[45]

Peter Dengate Thrush, co-chairman on the ICANN strategy committee, continued to be engaged in the process of shifting final control of the Internet away from the US Department of Commerce and transitioning ICANN from being a US-registered corporation to an international body. "We wouldn't have got this far without the support of the US but then there are equally difficult questions when people propose a United Nations-based body. The United Nations would spell the death knell for the speed of innovation that has made the Internet so successful. UN bodies do not have a track record for quick adoption, nimble policy making or responsiveness to technology or community issues. Most of us hope the new body will be substantially like ICANN because we've worked hard for a decade to get the right balance between registries, registrar and registrants. This is a genuine bottom-up process."

Agreeing on the next phase for an institutional structure, and getting the buy-in from current players and governments when there were so many vested interests was not going to be easy. "The international law of the seas took 400 years, so ICANN as an international body has made incredible progress by those standards through meeting every four months somewhere in the world. We will just keep transitioning until we get there."

InternetNZ finally formalised its relationship with ICANN through the signing of an exchange of letters at the end of October 2007. This meant that InternetNZ officially recognised ICANN's role in co-ordinating the root services of the Internet, and consequently ICANN officially recognised InternetNZ's role as the ccTLD manager for .nz.

The signing ceremony took place at a meeting of the ICANN board in Los Angeles, attended by InternetNZ and ICANN representatives including retiring chairman Vint Cerf, ICANN president Dr Paul Twomey, InternetNZ president Peter Macaulay, InternetNZ executive director Keith Davidson, and domain name commissioner Debbie Monahan.

Keith Davidson said the exchange of letters formalised a long-standing and mutually beneficial relationship since ICANN's inception in 1998.[46]

Three days after the 'exchange of letters,' on 3 November 2007, Peter Dengate Thrush was elected chairman of ICANN at its meeting in Los Angeles, succeeding 'father of the Internet' Vint Cerf in one of the most influential global roles in Internet governance.

He remained convinced the Internet was still in its early days. "It's like manned flight; we're only at the stages of the first crossing of the English Channel. We spent all this time on getting graphical user interfaces right but our children find typing emails as a means of communicating about as useful as tapping away on Morse code down a telegraph wire. Biological interfaces are already being researched. I remember saying a decade ago at an InternetNZ meeting that the Internet would one day become so essential that being deprived of it would eventually be regarded as severely as being deprived of oxygen."

16

Cyberspace junk

Nailing net nasties

Anyone who tries to create an Alsatia state would find themselves in breach of international law with the sanctions of the rest of the world ganged up against them bringing a sense of security to our domestic society for international electronic commerce.
Justice David Baragwanath, 1999.[1]

The digital environment ... is often referred to as "cyberspace" ... It is a workplace, a business arena, a social sphere for meeting new people and developing relationships, and a place for entertainment. However, it is a place where perpetrators of electronic crime can victimise the unsuspecting, and an environment which can facilitate anti-social behaviour like bullying and harassment. Schools are fostering wonderful Internet learning skills in children but must also include in that education the practical skills needed to negotiate all aspects of cyberspace safely.
Internet Safety Group report, 2003.[2]

In White Friars, England until the end of the 17th century, there was a 'safe place' known as Alsatia, where criminals and those seeking sanctuary could live outside the law. Many believed once unleashed from US military control, the Internet – outside of any one jurisdiction – became the embodiment of anarchy, a cyber version of Alsatia.

When the boffins and geeks ruled, the Internet was self-policing. Coteries of like-minded individuals gathered in specialist huddles, newsgroups, and chat rooms where their esoteric secrets were shared. Gamers, film buffs, sci-fi fans, musicologists, genealogists, and computer nerds felt safe sharing intimate details or their hobbies and habits. Among them were the coders who loved the challenge of proving they were smarter than the software developers, often exercising their prowess by cracking and hacking their way into allegedly safe systems, or liberating games and commercial software from the passwords and encoded protections their creators had put in place to ensure commercial success.

Advances in technology continued to outpace New Zealand's legal framework for well over a decade after the country gained a direct feed into the international Internet backbone; its laws,

more suited to the 1960s, were stretched to the limit grappling with hacking, cracking, piracy, privacy, copyright, trademark, and e-commerce-related issues. The legal fraternity and the politicians they depended on to keep the law current were ill equipped to understand, let alone prepare for the digital tsunami ahead. One farsighted attempt to gear up for the inevitable on-line crime wave was the formulation of hacking provisions, as part of proposed 1988 Crimes Act Amendment Bill, which provided for the criminalisation of computer vandalism. The Bill was shelved.

In the political mind there wasn't sufficient evidence of a threat, and besides, this newfangled computing fad wasn't likely to catch on outside serious business use or hobbyists. The cliched images of pimply teenage coders cracking into systems; or gamers determined to get to the next level, up for days on end in a zombie like state, pizza boxes and Coke cans littering the room, seemed too surreal to take seriously. This wasn't anything lawmakers or politicians need concern themselves with.

It takes all types to make a community and the Internet was no different, with its eccentrics, graffiti artists, scammers, spammers, digital downloaders, cyber pirates, and pornographers. Police precincts and jurisdictions became irrelevant when criminals engaged in cross-border activities. The old guard had been taken off guard, bobbies on the beat were not quick enough to apprehend cyber criminals. New tools, disciplines, and expertise was needed, and even then, unless the legal definitions were rapidly amended to cover cyber crime, the charges were unlikely to stick.

Within a decade though there was serious evidence that what had been unleashed was indeed a serious and pervasive threat, and at the same time a challenge that would transform government and industry and the way people communicated for the foreseeable future. You could legislate for three-dimensional objects made of atoms, but zeroes and ones zipping along our telephone lines were far too elusive. Certainly the archaic definitions in our laws that could barely cope with the era of photocopiers and fax machines needed a serious overhaul.

LAWS LAG COMPUTER CRIME

The fear was that without local and international legislation covering computer crime, a new breed of criminals could set up a base in New Zealand using the Internet to literally operate outside the law. Hacking, fraud, industrial espionage, the release of viruses, or cyber terrorism could bring down a business or a nation. In the United States more than US$10 billion worth of data was being stolen by thieves operating through computers every year. In 1995 alone banks and corporations lost US$800 million to hackers. New Zealand law was described as 'grossly inadequate' to cope with computer crime while international law was non-existent.

Shocking stories of what was happening around the world soon rallied the troops in New Zealand to try to plug the gaps in our digital defences. Paedophiles and pornographers using the Internet were the first group to be officially targeted by government agencies from 1996. The police, already stretched on terra firma, were perplexed in their efforts to patrol cyberspace and had to call in help from overseas experts.

Internal Affairs sought co-operation from ISPs in a sweep during 1997, which resulted in a heap of trashy sites and newsgroups being shut down. Between July 1996 and the end of 1997 the department had made 27 prosecutions relating directly to child pornography on the Internet. Internal Affairs national manager of censorship Steve O'Brien believed his department had been instrumental in helping clean up the Internet locally through monitoring Internet relay chat sites, such as 'pre-teen sex pics' and working closely with Interpol and the Australian Government. Specialised software had helped automate the process.

Other government agencies were keen to catch tax cheats and rip-off artists. For example it was logical some of the estimated $10 billion, cash-under-the-table black market the IRD was concerned

about was being transacted over the Internet. It commissioned a report in 1997 on the implications of e-commerce on its tax-gathering abilities. The trouble was large portions of the report became redundant when reports from the OECD, the United States, and Australia were released. The IRD began rewriting those recommendations for New Zealand. In the meantime – unless the Internet was declared a tax-free zone – responsibility fell to vendors to figure out where their customers were and to pay the appropriate tax.

In October 1997 New Zealand participated in a 30-nation international crack down, looking for get-rich-quick schemes. Over two days working the search engines 1000 web sites were found 'that might be illegal.' None were local. A standard letter was sent out and a follow-up showed 174 had 'disappeared or changed.' Ministry of Consumer Affairs general manager Keith Manch said the sting was really a test run. Now the 30 nations were confident they could quickly mount similar campaigns to look after each other's interests.[3]

People like David Overend, who posted underskirt images from his shoe camera on the Internet, and the exploits of pornographers and paedophiles, had given the Internet a bad name. Many saw it as a den of iniquity, a place where the dark side of life was displayed for all to see. There was no way their kids were going on-line. The law, despite the difficulty with definitions, sent a warning to such characters. Overend had after all committed a crime by 'distributing objectionable material.' He was subsequently sentenced to 21 months in prison and banned from access to computers or cameras. In 1998 Dustin Arthur Barrett of Christchurch was sentenced to a year in prison on similar charges.

Between 1997 and mid-2000, Department of Internal Affairs inspectors successfully prosecuted 49 cases involving the distribution and possession of objectionable material via the Internet. Manager of the Internal Affairs Censorship Compliance Unit, Steve O'Brien, said the unit was catching a New Zealand offender every three to five days. There were 40 cases pending. "Our unit is unusual in that it proactively pursues offenders rather that acting on tip-offs or on information gained during other inquiries. We work closely with overseas enforcement agencies and have already provided over 100 suspects for their further investigation." Most prosecuted offenders received large fines and suffered forfeiture of their computers and periodic detention. "The scary thing is that despite the publicity surrounding cases offenders are still willing to risk prosecution by trading this type of material," said O'Brien.[4]

Early in 1998 the NZ Police imported a UK expert to help establish a unit to get a handle on computer crime. John Thackray, a renowned computer forensics specialist, was on secondment from the South Yorkshire Police. Thackray, who headed the New Zealand Electronic Crime Unit, returned home in June 1988 to receive the Churchill Fellowship Medallion from British Prime Minister John Major for his efforts in computer crime research. His worldwide research in 1996, including time with the Federal Bureau of Investigation (FBI) and secret service working on electronic evidence gathering, brought together conventional and electronic forensic techniques that were now being used around the world. It resulted in a global family of computer crime investigators able to track cross-border fraud, working together to similar standards, so evidence gathered in one country was acceptable in the other.

Thackray's New Zealand electronic crime-fighting unit hugely improved the country's ability to investigate electronic evidence, put cases before court, and relieve the stress on those who had been found innocent. Previously much of his caseload would have ended up in the too-difficult pile, as every electronic breach needed to relate back the Computer Crimes Act 1989, which had been sitting in parliament waiting for an update for several years. Laws such as 'theft as a servant' or 'use of a document' had to apply. An electronic document, according to New Zealand law, was not a document. While the United Kkingdom, United States, and Australia had generic laws that related to the misuse of computers, hacking was not against the law here.

Thackray discovered a group of technical university students in a suburban New Zealand town had staged a competition to see how many Unix servers they could shut down. They crashed

more than a dozen businesses. Because nothing was stolen, little could be done under the Crimes Act. There wasn't even an easy way to prosecute those who made 'denial of service attacks' by bombarding and blocking a mail server at an ISP or business. "What do you charge them with?" asked Thackray. The police still had to prove intent and use traditional methods regardless of whether it applied to computers, CDs, floppy disks, removable drives, or servers. The Telecommunications Act had, however, allowed Telecom to get successful prosecutions, including one case where a hacker had obtained $80,000 in fraud.

ELECTRONIC CREDIT NOT REAL

In October 1998 the inadequacies of our laws were further exposed when charges were dropped against a North Shore businessman, who had been convicted of ten charges of obtaining credit by false pretences. A legal loophole saw the Court of Appeal overturn some of Wayne Wilkinson's convictions, handed down by the Auckland District Court, because credit obtained by electronic transfer did not amount to property that could be stolen. The court's decision included the statement that new laws to cover now common methods of financial transactions 'may well be desirable.'[6]

Less than a month later another example of how the law wasn't up to the crime was illustrated when an Auckland teenager, hacking into the offshore Web hosting server of Ihug, effectively destroyed more than 4500 web sites. Because local law didn't recognise his crime, Ihug was looking for some legal precedent to have the youth sent to the United States to face charges. Ihug director Tim Wood said the Web server was based in San Francisco and New Zealand law was inadequate for dealing with cyber vandalism. It was described as the worst case of computer vandalism to hit the country.

A Mt Albert youth admitted the hacking and appeared on the *Holmes Show* with his face disguised and using the name Spazrat, claiming he was 15 years old. The *NZ Herald*, however, claimed it had evidence the boy was in fact 19 and had used the name Sharkdog. The youth claimed he had been targeting the ISP, not the people who lost their Web pages. His defence was that Ihug had cut off a number of his friends' accounts 'for no apparent reason' and he was just showing them they were hackable and 'should follow the rules and be nice.'

Ihug said the boy had been bragging about his exploits on chat groups, claiming he was too young to be charged. A Law Commission researcher said if he had done nothing illegal under New Zealand criminal law, it would be difficult to argue in an extradition hearing that he should be exported to the United States for punishment. The hacker had accessed the system via 'a security hole in a CGI script' – a small program on a Web page – and then damaged the disk drive and emergency back up on the computer server. "When basic services were restored we found we had lost a large proportion of customers' directories; 4586 were unrecoverable," said Ihug. About 500 commercial sites were affected.

The identity of the cyber vandal was later exposed on a web site. He was Morehu 'Maxx' Whyte, who called himself Sharkdogg. His actions added to growing calls for the government to increase security and tighten the law as it related to hacking and electronic vandalism. The news of the attack on Ihug's site also forced disclosure of further acts against ISPs. Telecom for example was beefing up its safeguards against hackers who had compromised the security of its accounts. It learned a hacker had acquired passwords to hundreds of its customers using 'sniffer' software, which meant offenders could log on to a legitimate account and use their bandwidth, which at the time was an expensive commodity at around $3 an hour.

In a comment piece in the same issue of the *NZ Herald*, journalist Chris Barton warned that New Zealand's laws were in dire need of an update to cope with electronic crime and

vandalism. At best it seemed the hacker could only be charged with wilful damage to property under the Summary Offences Act, or for the offense of 'disturbing' use of a telephone under the Telecommunications Act, both of which had maximum penalties of $2000 fines or three months in prison. The latter was unlikely to proceed because there was no recipient of the phone call. A proposed change to the Crimes Act, which would have given provision for computer-related offences such as hacking, was still at the first reading stage and hadn't been considered a high priority by successive governments.[7]

There remained considerable confusion over whether current laws were strong enough to achieve prosecutions for hacking, or as the Internet Society correctly defined it, 'cracking.' Minister of Justice Doug Graham considered section 298 (4) of the Crimes Act, which covered damage to 'property not otherwise covered in the Crimes Act,' should be used to prosecute 'crackers.' However according to ISOCNZ it had become clear over the previous decade that the Act was woefully short on sanctions against such activities. The society was consulting with the wider Internet community to establish the specifics needed for any new legislation. One suggestion was for the government to resurrect the 'hacking' provisions of the 1988 Crimes Act Amendment Bill. "Unfortunately the bill was shelved at the time and New Zealand was still without sanctions to protect the public against this type of activity," said ISOC chairman, Jim Higgins.

He warned New Zealanders not to take a kneejerk reaction to the recent spate of cracking and vandalism and attacks on ISPs, which needed to be put into perspective. "While vandalism of computers is a serious problem, there is no reason for people to assume that there is a widespread problem with the Internet in New Zealand. It is possible for Internet site operators to provide a high level of security and to protect themselves by taking sensible backup." And while it was true that no organisation could guarantee 100 percent invincible computer security, it was possible to make life difficult enough for crackers that the risk was greatly reduced.

"We must remember that no bank is immune from being robbed, but this doesn't mean we should worry about using banks. In terms of electronic commerce we have never heard a report of credit card details being stolen from a secure Internet server – even if this should happen it is the credit card company, not the customer, who carries the risk and burden of proof of purchase. Any new laws must be robust enough to keep pace with the increasingly innovative technology we have, and a bad law can be worse than no law at all," said Higgins.[8]

AMENDING CRIMES ACT

In April 1999 Higgins was more strident in welcoming the so-called e-crime bill, saying ISOCNZ had been asking for a law to protect Internet providers and everyday users. "The existing laws are quite inadequate to deal with the increasing number and complexity of computer crimes. The alleged creator of the Melissa virus had been charged in the US with offences which would probably carry a jail term of up to 40 years. In New Zealand he would probably get off scot-free because of our antiquated laws." Despite his identity being known, no charges had been laid against the person responsible for deleting 4586 Web pages hosted by Ihug. Meanwhile the long-awaited Crimes Amendment Bill (No 6) introduced to parliament on 7 August would have to wait until after the 1999 elections when Labour took power.

Justice Minister Tony Ryall said the bill would redefine 'property' to clearly include the balance of a bank account and extend the definition of 'document' to include electronic files. "Our Court of Appeal demonstrated last October that New Zealand suffers because our law knows nothing about the theft of electronic credits," said Law Commission President Justice David Baragwanath. A man who fraudulently obtained cash through direct transfer was let off the hook. While the Bill now

in progress plugged that hole, there were still no real sanctions available to deter those who 'abuse our systems.' However the idea of New Zealand or any other nation becoming a territory where computer crime could go unpunished was abhorrent to the New Zealand Law Commission. Its members believed harmonising the laws of each nation to allow criminals to be charged under either local or international law would give new credibility to the evolving world of e-commerce.

New Zealand was working fast to ensure its laws met the challenges of the digital world, but the United Kingdom, Canada, Australia, and Singapore had already enacted legislation. Borders had become increasingly irrelevant and the main attention had been on civil law, which failed to deal with the fact "rogues, vagabonds, shysters and criminals were now using the latest technology," said Justice Baragwanath. He was keen to see new mercantile and criminal law, spanning a borderless world to allow unhindered e-commerce, and opening the way for proper reciprocal extradition treaties. He wanted to see computer hacking as a crime transcending state systems. He quoted from an essay in the *Criminal Law Review*, which suggested the power of the International Criminal Court should ensure civil governments abide by international law, and the exercise of the whole range of economic, political, and military sanctions remain open to end 'the culture of impunity.' "Anyone who tries to create an Alsatia state would find themselves in breach of international law with the sanctions of the rest of the world ganged up against them, bringing a sense of security to our domestic society for international electronic commerce."[9]

Meanwhile Telecom's fraud management programme had alerted 10,000 customers to suspicious calling patterns since its establishment in June 1997. Programme manager Colin Yates said the Hewlett-Packard fraud detection system identified anomalies in the calling patterns of 300 businesses, which had since confirmed this, preventing them from suffering loss. The system, he said, had reduced annual fraud among its customers from \$50,000–\$80,000 to \$700–\$1000 a year. Telecom recorded \$27 million in bad debt for the year ending 31 March 1999; around 60 percent of that came from telephone fraud. It was not unusual, he said, for some customers to receive bills with an extra \$50,000–\$80,000 for calls they had not made. In most cases these would be routed through an insecure PABX. While most of the high-cost fraud originated offshore, he said local fraudsters often opened phone accounts under false names. The Internet meant New Zealanders were now as vulnerable to telephone fraud as any country. Fraudsters here knew about new techniques from the United States in minutes.[10]

In July 1999 a computer 'phreaker' who made more than 21,000 phone calls received a 12-month suspended prison sentence and six months' periodic detention, when he appeared in the Auckland District Court. Borislav Misic became the first phreaker or telephone network hacker to be convicted in this country. The 23-year-old had arrived in Auckland from Yugoslavia in April 1998, seeking refugee status. By late May he had made 21,192 calls to Spain and Tonga from five telephone lines in his central city apartment. After his lines were bugged, Telecom staff concluded he was using a 'blue box' computer program to send signals down the phone lines which prevented the calls from being billed.[11]

Computer crime had escalated from the domain of geeks proving how clever they were to their peer group, to an all-out crime spree and billions of dollars were being lost through virus invasion, industrial espionage, and hack attacks. At the core of the knowledge economy was intellectual property; important files and documents about businesses and their clients, confidential data, trade secrets, and transaction histories – often saved to computer disks, tapes, or storage silos. With the increasing sophistication of computer-based crime, companies had to rethink everything, and start with the assumption that their IT systems and information assets were vulnerable. Every step possible needed to be taken to establish ironclad security that could regularly be strengthened or updated, to cope with the latest threats.

According to the Internet Security Survey sponsored by eSolutions, Telecom, and Xtra, poor security put the reputation of New Zealand businesses seriously at risk. The survey found 58 percent of businesses considered the information held on their computer systems was extremely sensitive and confidential but 82 percent did not have intrusion detection tools in place. In other words they wouldn't know whether they had been hacked into or not, resulting in the low number (8 percent) of known intrusions.

The Internet had become a riskier place for businesses since the terrorist attacks of September 11, and things weren't likely to improve any time soon, according to Internet Security Systems (ISS) in its security incident report for the first quarter of 2002. It warned overall Internet security had been hampered by a steady tide of DoS attacks, as well as the rise of hybrid attacks, including the propagation of worms such as Code Red and Nimda, which spread through the Web and email via file sharing and instant messaging. "Attacks are now global in scope and round-the-clock in incidence. There's no such thing as a low-level threat on the Internet. If you're going to connect to it, you better have a suit of armor," warned Dennis Treece, director of the X-Force Special Operations Group at ISS in Atlanta. The company compiled its data from more than 350 high-volume intrusion-detection sensors it managed around the world, saying the vast majority of attacks – nearly 70 percent – were being launched on server port 80, the same port that Web traffic flowed on.

Port scanning was a common activity before an attack was launched, and a way of discovering details and vulnerabilities about networks. Experts predicted there would be many more such worms and nasties released to attack corporate computer systems. The threat would grow for emerging areas of computing such as broadband, wireless, and instant messaging. Firewalls alone could not prevent this kind of unauthorised access, additional intrusion, and defence technology was needed. Hackers and crackers were constantly on the look-out for security vulnerabilities in new or existing software, where the developer hadn't yet come up with a patch, or where the company had failed to download a fix to eliminate vulnerabilities.

INFRASTRUCTURE UNIT FORMED

The owners of storage and processing systems were being warned to take very specific steps to protect their assets and monitor their networks. Clear company policies were needed to state how information should be stored and protected, and who should have access to it. Without such policies, along with the now essential firewalls, antivirus scanners, and intrusion detectors, businesses might not even know their systems had been attacked and corporate secrets compromised.[12]

An important step in protecting the rapidly emerging electronic environment was put in place in August 2001, with the creation of a specialised government unit that would watch over the security of essential public and private sector infrastructure. Various governments had previously dismissed attempts to create an independent early warning system along the lines of the US-based Computer Emergency Response Team. Now Cabinet had approved the Centre for Critical Infrastructure Protection to be housed in the Government Communication Security Bureau (GSB). It would essentially watch over infrastructure considered essential to maintaining the political, social, or economic life of the country, including energy and telecommunications systems, transport, finance, and law and order. While owners of infrastructure would remain responsible for the security of their own systems, the centre would provide co-ordination, support, and advice on the ways in which the country could maintain and improve its security. The centre would provide a 24-hour 'watch and warn' advice about threats from viruses to hacking attempts.[13]

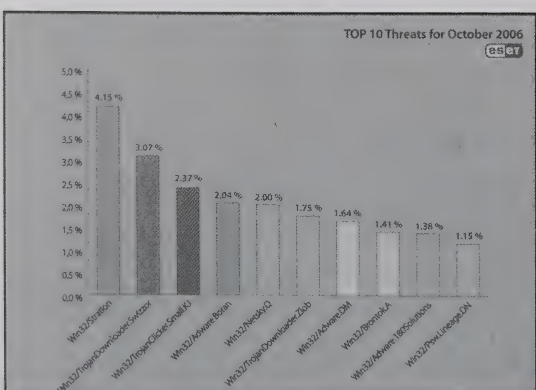
Cabinet papers obtained by the *Weekend Herald*, backgrounding the special unit, indicated one of the country's most critical infrastructure companies had been under attack for months from cyber-

terrorists. The briefing papers said the risks were increasing dramatically. The State Services Commission admitted a large telecommunications company had been under sustained attack for several months but no one would confirm who that was. The general view was that it was Telecom, which had shut down its Netgate international Internet link in January 2001 after intrusion problems.[14]

Amendments to the Crimes Bill were still being debated in September 2001 amidst claims that New Zealand had become a staging post for cyber criminals, including credit card thieves who stored their data locally, believing it would not be traced. There were also allegations of a high incidence of electronic fraud. The lack of specific laws making hacking and computer crime illegal didn't help dispel the growing perception of New Zealand as a digital backwater. Some still wondered whether the proposed law changes went far enough while others were concerned they went too far. The Crimes Act drawn up in 1987 allowed police to tap voice messages only; the new one opened the way for scrutiny of email and other electronic messaging. It would make hacking and computer snooping illegal, except when carried out by police, the Security Intelligence Service (SIS) or the GCSB. Police would still, however, need to seek a warrant to gain access to a telecommunications network. Carriers would have to ensure their networks were compatible with official snooping requirements, and allow specialised hardware and software to be used.

The bill was attempting to strike a balance between individual privacy and the interests of state. InternetNZ and others believed the terminology was too broad. For example ISPs often had to deny service to customers if they themselves were facing a DoS attack. Would that make them liable under the proposed changes? The software, specialist tools, virus code, or data that could be used to commit a crime might also be used by those trying to prevent such a crime, or as a matter of course by a network manager, or IT specialist to administer or test security in a network. Would they be breaking the law by doing their job?

Concerns had also been raised that the law abiding or the simply curious might get caught in the e-crime net. Would you be breaking the law when researching cyber terrorism or if documents about hacking were found on your hard drive? Or if you had certain web sites bookmarked, making available or discussing programs that could be used for hacking? IT Minister Paul Swain reacted swiftly to detractors with a 'let's not be silly' stance, saying the keywords were 'intentionally and recklessly.' Legal interpretation might, however, be required before deciding who was a criminal. He insisted the new law would not criminalise the legitimate use of IT security software. A salesperson marketing a package as being useful for committing crime could be committing an offence. However the law did not intend to trap those who innocently or accidentally sent out an infected email which replicated itself through email address books. "Criminal recklessness requires that someone deliberately and unreasonably takes a risk knowing the possible outcome."



Certainly, the new law would make it much easier for the police to become involved. Maarten Kleintjes, head of the Police Electronic Crimes Unit, told the *NZ Herald* the bill would give police a much better handle on the new channels criminals used. "Currently it's a bit like police only being allowed to breath-test people driving white cars, while people in coloured cars get away."[15]

Meanwhile the long-delayed Electronic Transactions Bill was due to

pass into law in October 2002, giving electronic transactions broadly the same status in law as transactions concluded on paper. While the Labour Party had been accused by the IT industry in particular of failing to give the Bill the priority it needed, it had the potential to open the way for growth in e-business, remove legislative barriers to on-line trade and reduce compliance and transaction costs. IT bodies such as ITANZ and InternetNZ insisted this and the Crimes Amendment No 6 Bill, which criminalised 'hacking,' were important for the progress of e-business.

The Crimes Amendment Bill at the time was still sitting at the number 37 position on the parliamentary order paper.[16] While IT Minister Paul Swain applauded the passing of the Bill on 10 October, there was still some way to go. The Electronic Transactions Act 2002 was delayed by the need to pass regulations to clarify grey areas on how the act should affect other legislation. A discussion paper was released on 11 April 2003 and submissions on the proposed regulations closed on 1 May 2003. The Act finally came into force on 21 November 2003.[17]

Then the Crimes Amendment Bill passed into law on 4 July 2003, introducing the most significant changes to property related crimes since the Crimes Act was first enacted in 1961, according to Police National Crime Manager Detective Superintendent Rob Pope. "The changes are intended to bring property-related offences into the modern era in recognition of the use of advanced computer technology for criminal purposes." Important changes were also made to police interception powers, expanding the coverage and nature of warrants in the fight to combat organised crime.

Theft-related crimes were now extended to cover intangible property, a series of new computer-related crimes were created to cover such events as hacking, the term 'breaking and entering' was replaced with 'entering without authority' for burglary, and fraud offences became 'obtaining by deception.' It was now illegal for unauthorised people to intercept emails and faxes not intended for them. "Increasingly police are receiving complaints involving the use of computers to commit property related crimes, many of which are not addressed by the current law. These amendments will better equip police to respond more effectively to property related complaints," said Pope. The new law came into effect on 1 October 2003.[18]

Specific offences included:

- *accessing a computer system for a dishonest purpose (either to obtain a gain or to cause loss);*
- *damaging, destroying or interfering with a computer system by modifying, altering or deleting data;*
- *taking, obtaining or copying trade secrets (these are very widely defined);*
- *accessing a computer system without authorisation;*
- *making, selling, distributing or possessing software for committing a crime.*

Penalties ranged from two years at the lower end, to ten years for cases where someone intentionally or recklessly destroyed, damaged, or altered a computer system, knowing that danger to life was likely to result.

SECURITY BECOMES PRIORITY

A more holistic and manageable approach to network security was being demanded by businesses as they faced a plague of viruses, spam, and increasingly sophisticated attacks from hackers and crackers in 2004. The pressure was on for companies to review vulnerable code and security policies, and for vendors to move to intelligent, multi-layered security systems that tightly integrated with network management. "People are moving beyond simple firewall and antivirus applications to a solutions approach where hardware, software and management of security is viewed as a whole, often embracing areas outside IT, including surveillance," said IDC New Zealand security research specialist Jane McPherson.

An annual survey of chief information officers in Australia and New Zealand saw IT security move from 17th position to number four. McPherson said many companies seemed to have a lax attitude towards policies and procedures, and little understanding about new government initiatives to protect consumer data, electronic transactions, and privacy law changes, for example, in the Crimes Amendment Bill. "Many companies are more liable than they realise if consumer data gets into the wrong hands. Once they become aware of the risk this will become a major driver of security spending."

The proliferation of 'malware' – malicious software, ranging from unexpected code to viruses, Trojan horses, worms, and even spam – was a major contributor to increased security spending. According to TrendMicro, PC viruses cost businesses approximately US$55 billion in damages in 2003 – about double the damage of 2002, and more than four times that of 2001. The need to keep on top of, not only antivirus updates but also operating system and software patches, was embarrassingly evident by the fact that across all products, Microsoft released 51 security advisories in 2003, 30 of them affecting its Windows XP operating system.

A Gartner report in May 2004 suggested 90 percent of mobile devices lacked protection to ward off hackers and many users weren't taking proper precautions. John Girard, research vice president at Gartner, said wireless mobility was the greatest change to occur in corporate data collection and distribution in the past decade, presenting new threats which required sound management policies to protect information assets and contain costs. Gartner recommended moving all PDAs and phones into the PC support group, installing PDA firewalls, implementing cost controls, and purchasing mobile management tools.

Peter Benson, managing director of Security-Assessment.com, believed securing badly written Web and system applications was becoming more important than securing the perimeter. "There is no such thing as a perimeter these days. It's gone. Organisations connect to partners; they have remote dial-up and VPNs; they've become virtual enterprises." He said security products were just products, not security. "If you build systems right in the first place firewalls, antivirus and intrusion detection should be the backstop not the first point of alert." Penetration testing a couple of times a year was not enough. Continuous auditing was necessary as part of vulnerability management.

Leanne Buer, Telecom Advanced Services (TAS) security business manager, believed businesses should have a security audit, including penetration testing, before outsourcing, or moving into any major development. A first step might be securing the perimeter and consolidating all access points to the network, including wi-fi and remote access. "Every customer has a duty to understand their vulnerabilities before developing policies and figuring out what the acceptable levels of risk are." She said security was about defence and depth. "Perimeter security is fine but you also need to secure remote technologies so the business can operate where and when it wants."

Security was becoming a 24x7 concern. "The average IT department in New Zealand is two people – keeping up with vulnerabilities in hardware and software is difficult. That's why you need a specialist, because that's all they do. One of our customers, before they came onto our system, was getting any virus going and had a little hit squad of IT people going up and down the country rebuilding Web and file servers."

ISPs were increasingly seen as business partners and needed to have high levels of security. Iconz, for example, had two permanent security officers and every quarter bought in a specialist to conduct a security audit of its Unix and Microsoft environment, right down to the IP level. Iconz CEO Sean Weekes believed it was important to have an independent audit, and for ISPs in particular to segregate the hosting and local environment. "If you stand still the environment goes backwards. You must keep proactive. Those companies that can't afford to have someone monitor their networks should be outsourcing," he advised.

EXPLOITING THE VULNERABLE

The most frustrating thing about having a PC with an Internet connection was being an automatic target for the growing diversity of 'malware' or malicious software. Like the real world, cyberspace had its red light districts and risky neighbourhoods where viruses, Trojans, spyware, netbots, and a host of other net nasties lurked, seeking to exploit vulnerabilities.

A program called Elk Cloner, written in 1982, was allegedly the first computer virus to appear 'in the wild.' Written for the Apple DOS 3.3 operating system and spread by floppy disk, it was created as a joke by a high school student and embedded in a game. The 50th time the game was played, a blank screen appeared with a poem about the virus: 'It will get on all your disks. It will infiltrate your chips. Yes it's Cloner! It will stick to you like glue. It will modify RAM too. Send in the Cloner!' The computer would then be infected.

The first PC virus was a boot sector infection called Brain, created in 1986 by two Pakistani brothers to deter pirates from copying software they had written. Most early viruses were spread by the exchange of floppy disks or infected programs. As the use of BBS and connected computers increased, so did the spread of viruses and Trojan horse programs. Often viruses were written to infect popularly traded shareware and bootleg software or the trading of pirated copies of retail software.[19]

PCS GET STONED

Virus developers kept pace with the various operating systems and continued to release new infections, some of which carried deadly payloads, wiping important files, or whole sectors of a disk rendering computers useless. Others were simply an annoyance. In 1987, for example, the Friday the Thirteenth virus sat in the computer's memory, incrementally slowing down performance until the next time a Friday fell on the 13th, at which point it would delete all .com and .exe files.

The same year, a virus written by a Victoria University student started doing the rounds, creating relatively harmless havoc but nonetheless causing great concern. The notorious Stoned virus, also known as the Marijuana or New Zealand virus, was the first master boot sector virus. The fact that New Zealand was the largest consumer of reggae music, and possibly related herbal substances, outside of Jamaica, may have influenced the code monkey who devised this invader.

There were at least four known Stoned variants which infected MS-DOS computers. It wasn't deliberately destructive, although it did overwrite some of the boot sector master record which created disk errors, making it difficult to start a computer. On infection it produced a screen message which stated: "Your computer is now stoned. Legalize marijuana." The *Dominion* newspaper reported that the appearance of the virus in Australia caused particular embarrassment:

A computer virus called Marijuana has wreaked havoc in the Australian Defence Department and New Zealand is getting the blame. Data in a sensitive security area in Canberra was destroyed and when officers tried to use their terminals a message appeared: "Your PC is stoned – Legalise marijuana."

The New Zealand-spawned marijuana virus has managed to spread itself widely throughout the region. Its presence in

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Australia has been known for the past two months. The problem was highlighted two weeks ago when a Melbourne man was charged with computer trespass and attempted criminal damage for allegedly loading it into a computer at the Swinburne Institute of Technology.

The virus invaded the Defence Department earlier this month – hitting a security division responsible for the prevention of computer viruses. A director in the information systems division, Geoff Walker said an investigation was under way and the infection was possibly an embarrassing accident arising from virus prevention activities.

Initially it was believed the virus was introduced by a subcontractor installing the new computer system but that possibility has been ruled out. One more outlandish theory suggested New Zealand, piqued at its exclusion from Kangaroo 89 military exercises under way in northern Australia, was showing its ability to infiltrate the Canberra citadel. New Zealand was not invited to take part in Kangaroo because of United States' policy of not taking part in exercises with New Zealand forces since Labour's anti-nuclear legislation ... New Zealand Defence Department spokesman Lieutenant Colonel Peter Fry categorically denied the claim. "It would be totally irresponsible to do this kind of thing. In fact, New Zealand's Defence Department already had problems with the virus," he said."[20]

The influx of Internet nasties from 2000 onwards became a plague, making antivirus software compulsory. While most medium to large enterprises were secured with firewalls, mail gateways, content filters, and antivirus scanners, small business and home users were facing an infestation.

The worldwide economic impact of virus attacks, including repairs and lost productivity, was estimated at more than $13 billion in 2001, a reduction of US$S4 billion over 2000, according to *Computer Economics*. A big reason for the high 2000 figure was the attack of the Love Bug, which caused US$8.75 billion in damages. Its successor, Nimda (admin spelled backwards), infected more than two million servers and 700,000 PCs in just 24 hours.

Most at risk were those who hadn't bought or updated antivirus packages or failed to download patches to close security holes in Microsoft products. According to ICSA, 87 percent of major virus infections were carried by email. Many PC resellers were bundling antivirus software, and the main ISPs had been so inundated with infectious email they were putting up their own defences. Xtra installed a million dollar, state-of-the-art, antivirus email filter in July 2002, which began destroying 30,000–40,000 viruses a day. Within four months it had dealt to more than 541,000.

Sonic WALL claimed there were over 50,000 known viruses, with 200 to 800 discovered every month. The W32/Klez worm had swept its way into mailboxes causing major disruption and inconvenience, then from September 2002 the W32/Bugbear worm accounted for more than 70 percent of all virus activity. The invader copied itself to all network-attached devices then emailed itself out to all the contacts in the user's mailbox and hard drive. It included a Trojan horse that attempted to capture passwords and credit card details for the virus writer. Unlike previous virus threats, seemingly innocuous messages containing

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Klez or Bugbear activated without opening the attachment. Unless you had the latest version of Internet Explorer or had been keeping up with the security patches, they would auto execute. Even placing your cursor over the incoming message to delete it could cause it to dump its payload.

These viruses had their own in-built mail client which compiled addresses from the infected machine, then randomly selected the 'from' line telling the recipients it came from your computer. In reality it was impossible to tell where it really originated. As viruses got smarter they even found ways to deactivate antivirus software.[21]

LOOPHOLES AND VULNERABILITIES

Users worldwide were frustrated about the need to plug holes in mainstream software as hackers, crackers and spam perpetrators found loopholes and vulnerabilities. A growing number of filters, able to strip out unwanted content from email, were available and more ISPs were adding their own spam filters to curtail the torrent of junk mail. Users were heading to technical and antivirus sites in their droves for advice, protection, and updates. Central Command's Dirty Dozen for 2003 rated the Sobig.F worm as the biggest threat, despite it having a termination date of 10 September. Its aggressive email spreading routine saw it cripple many computer systems. Next on the list for its annoyance factor was Gibe.C, and Gibe.F worm, which craftily disguised itself as a security patch from Microsoft. Many people followed its link and became infected. In fact Microsoft never sends out emails of this nature, instead advising users go direct to its home page to update and acquire patches.[22]

Malware and viruses usually target holes in PC operating systems or browsers to damage, destroy, or disable, but increasingly net nasties were looking at ways around security software to get at personal data. A Yankee Group report in the United States found holes in security software had overtaken Windows-related security problems by the end of 2004. Through to May 2005 it found 77 flaws affecting antivirus and other security products. A survey by Bigfoot Interactive discovered 55 percent of users had been infected with spyware and 82 percent believed it posed a threat to their on-line privacy.

Phishing, which tried to hook people into scams to disclose personal information, was becoming a major threat. In New Zealand bogus notifications, allegedly from major banks, were requesting users to update secure information. This was something the banks would never do, and those duped into following through were likely to find funds withdrawn from their accounts. Symantec, the company behind Norton security products, warned phishing attacks had increased from 2.99 million messages a day in the last half of 2004 to 5.7 million in the first half of 2005. Its Brightmail anti-spam service claimed one in every 125 email messages it scanned was a phishing attempt to access confidential information.

Geoff Cossey, director of Chillisoft, warned the sheer volume of malware had gone through the roof. In 2004 there were about 100 new examples a day. By 2006 that had escalated to more than 3000 unique threats. Some writers had created a 'zombie army' to hijack people's computer resources. These might arrive on an email or be picked up through a Web browser vulnerability, creating a 'sleeper agent' awaiting

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instructions. Their task might be to log keystrokes looking for passwords, launch a DoS attack on other computers using your bandwidth or send out spam via a mini mail server downloaded to your machine.

Cossey, representing NOD32, from Europe-based Eset Software, said 99 percent of people taking the right precautions wouldn't get infected, but a surprising number of users didn't have good antivirus software or failed to keep it up to date. He suggested traditional signature-based detection was becoming too slow to capture, fix, and disperse antidotes for many of the threats on the Internet. The first iteration might only be active in the wild for three hours, the time it takes for antivirus companies to come up with a fix. In the meantime an updated version was loose. "There are often cycles of 20-30 of these things in a period of a few days which makes user's extremely vulnerable." Heuristics or 'predictive guessing' was preferable to identify potential viruses, and catch any unacceptable activity on a PC, he said.[23]

By 2006 most computers were sold with adequate antivirus and security software but myriad new bugs continued to be released, looking for vulnerabilities to exploit. As the latest research implied, no browser was safe. Broadband uptake increased the speed at which we cruised around cyberspace escalating the risks from browsing, downloading, emailing, and participating in social networks.

Security company McAfee warned a growing number of search phrases on Google and other search engines were taking users directly to malware sites. Celebrity web sites were the most unsafe places to visit, with porn and screensaver web sites the second and third rated danger zones. McAfee said malware was growing exponentially with more than 4000 variants of 450 types of threat discovered by August 2006, compared with only 45 types from 2000–2002. It said the sheer volume of rubbish was literally becoming a turn-off for many Internet users.[24]

The major antiviral and security companies, Computer Associates, McAfee, Symantec, Trend Micro, BitDefender, and others, continued their annual tradition of alerting consumers and businesses about their latest updates, always pledging to be more intuitive with less interruption to our daily lives through their safer surfing suites. Their offerings included firewalls to keep potential invaders out, antivirus software to detect and eliminate viral threats, spam filters to safeguard us from the modern equivalent of junk mail, and tools to take the hook out of phishing attempts to acquire log-in, password, and other sensitive personal information.

HOAXES FOR THE GULLIBLE

While most antivirus packages had automatic updates it was important to ensure these were always current with regular scans to ensure computer systems remained clean. Then there were those annoying pop-up screens warning your PC had been infected with spyware: 'please click here for removal.' Clicking often installed spyware. If the message wasn't from your own antivirus software, the advice was – ignore it. And many virus alerts were in fact hoaxes, warning of some new menace that would eat your hard drive or corrupt your data, urging you to pass on the virus alert to everyone in your mail box, resulting in the recipient becoming a virus of the uninformed human kind.

While many vendors were integrating antivirus, firewall, and anti-spam products, the speed at which viruses proliferated left users wide open to attack. Vendors could typically release a patch file within two to four hours of a new threat being released into the wild, however, the Slammer worm was able to hit 5.5 million hosts in about 11 minutes.

"Two hours doesn't cut it anymore. The whole approach of looking for a virus signature and then blocking it means someone has to get the virus first," said Cisco systems engineer Arron Scott. Cisco had come up with the concept of the self-defending network which detected unacceptable behaviour. "Why would your SQL database try to probe thousands of hosts per second? Why would an application want to format its own hard drive?"[25]

Ken Low, senior security manager of 3Com Asia Pacific, claimed in March 2006 than an average of 33 dot.nz web sites were being hacked every month. From December 2000 to March 2006, 2123 dot.nz web sites were hacked. Of these, 1641 had a dot.co.nz address, but dot.net.nz, dot.org.nz, dot.govt.nz and others had also been hit. New Zealand had mid to low level per-month hack rate compared with other OECD-countries. Australia was much worse off, with nearly 200 government web sites hacked over a couple of years. In New Zealand it was closer to 15.

"Apart from the fact that Australia has a bigger population, there are also political and religious reasons behind a lot of attacks, whereas New Zealand in general was seen as a neutral country," according to Low. Of the top ten hackers targeting New Zealand, four were most likely local. The rest were internationally known criminals. He warned the problem wasn't going to go away any time soon and traditional intrusion solutions, including antivirus software and firewalls, were too slow. What was needed was intrusion prevention, not intrusion detection.[26]

DELICATE DIGITAL EVIDENCE

Nabbing those responsible for e-crime was a complex business, fraught with technical and administrative issues. There was the risk of contaminating digital evidence through improper checking by police, which could cause problems with prosecutions. Auckland-based Crown prosecutor Marc Corlett, speaking at the NetSafe Cyber Security Symposium in July 2006, said evidence had to be carefully presented to 12 jurors who were variously ignorant of computers. "All they hear is a policeman has come in and changed data; all the defence has to prove is reasonable doubt and if the jury is sufficiently confused by the information, there is reasonable doubt." He said prosecutors needed to find ways to translate digital evidence into a presentation that juries would find interesting. The traditional oral testimony approach was unlikely to succeed where juries had limited understanding of technology.

Sheer volumes of digital evidence could also prove problematic. Corlett said he was prosecuting a case involving hacking into on-line bank accounts where there was a huge amount of material that needed to be carefully managed to avoid confusion. New Zealand had moved beyond the first, and second, generation of computer offending, where technically skilled people did it to show how clever they were, to a the third generation of e-offending involving organised crime. "As prosecutors we're increasingly seeing this more sinister involvement (of) increasingly sophisticated e-offending."[27]

The harshest ever sentence for Internet fraud in New Zealand was handed down to 19-year-old Mark Hayes in May 2006, when he was sentenced to 2 years and 11 months after accessing TradeMe members' bank accounts. Between Christmas and New Year 2004 the Auckland teenager hacked into bank accounts and email addresses, then used the email details to access those accounts and purchase items before the bank found out and began reversing payments. Seven people had their identities stolen and it was only when sellers began asking TradeMe why their payments were

reversed that TradeMe began investigating. TradeMe spokesman Mike O'Donnell said fraudsters left deep footprints on the site and the company was committed to prosecuting them.[28]

Further evidence that Internet crime was escalating to a more serious level came from a report from Internet security firm McAfee in December 2006, which alleged gangs were adopting 'KGB-style' tactics to recruit accomplished computer students to help them commit on-line offences. In its annual report on cybercrime, McAfee claimed criminals were targeting universities, computer clubs and on-line forums to find suitable undergraduates. Some gangs had sponsored promising students from other disciplines to attend computer courses before planting them in businesses as 'sleepers.' The students would be asked to write viruses, commit identity theft, and launder money in a multi-billion dollar industry that was more lucrative than the drugs trade.

The report said the tactics were similar to those of Russian agents who sought out experts at trade conferences or universities during the Cold War. McAfee said its study was based partly on FBI and European intelligence which pinpointed Eastern Europe as a prime target for cyber crime recruits because of high unemployment and low wages. Hackers were paid to write viruses that could infect millions of machines, to obtain confidential information such as credit card information or send unwanted spam emails.[29]

The spectre of cracking was raised again in 2007 when the notorious Turkish hacker Iskorpitx got into a US-based server and defaced the web sites of about 600 New Zealand companies. The affected web site owners were former customers of Internet company Quik.co.nz, which Ihug had acquired in 2006. It took over a week for one of the victims, Auckland-based Just Hardwood Floors, to restore its site. It cost thousands of dollars to fix all the sites. Its operations manager Jonathon Cooke was concerned by claims each company needed to back up its own site. He was using an on-line program to upload text and pictures into a template designed and hosted by Quik, the former New Zealand franchise of US-based ISP Quik.com. However it didn't allow the customer to make a back-up at their end.

The company lost Web development work hosted at the site which Quik had also failed to back up. Gillian Richardson from Automotive Security Systems said she'd lost 80 percent of her business through the company web site being offline. She relied on an Ihug competitor to help her get back on-line and changed ISPs after Ihug admitted there was nothing it could do and that it was working with the Web development side of Quik in the United States, which it did not own. Ihug offered a month of free Web hosting and promised to move all former Quik customers to its own secure servers where regular back-ups were done.

OUDATED AND INSECURE

Rival Web hosting company PrimeHost warned many ISPs were running insecure and outdated systems. Operations director Dale McIsaac said many companies were still using vastly outdated systems to host commercial customer web sites. "Many successful hacking attempts are due to Internet providers running outdated software on their servers, and customer installed-applications such as bulletin boards, forum software and mailing lists are commonly exploited by Internet hackers."[30]

Nearly three months later another Turkish hacker, this time going by the name 'crackers_child,' struck around 20 sites hosted by Digital Network, attacking programs, files, and folders that had insecure permissions. The hacker overwrote existing content on the sites, leaving an obscene message taunting the owners about security. A URL leading to a Turkish language security forum was also posted by the hacker. According to security web site Zone-H, crackers_child was responsible for more than 20,000 attacks in April alone.

Digital Network manager Warren Sanders said the sites were restored from back-ups and the clients affected would be contacted. He claimed the hack "was a minor incident" and Digital Network had taken advice from security specialists in the United States on updating servers and improving security. There was a fine line around how far a Web hosting company could control users and offer standard Web hosting at the same time. In August 2006 another Turkish hacker hit Wellington Web hosting company iServe, causing widespread damage. ACT MP Rodney Hide was among those whose web site was defaced.[31]

In mid-July 2007 a split verdict was delivered in the long-running trial of computer hacker Andrew Garrett, who was found guilty on four charges of reproducing a document with intent to defraud and one count of threatening to damage property. The fraud charges related to Garrett's obtaining Internet access passwords from computers remotely, using the Back Orifice Trojan virus. The final charge on which he was found guilty was threatening to damage property. This related to a message Garrett sent to an Xtra account holder telling the user to change their ISP or have information on their hard drive deleted.[32]

A report from security company Sophos in July 2007 said the number of infected Web pages had soared nearly six-fold since the beginning of the year, evidence of how widespread Web attacks had become. In June, it detected an average of almost 30,000 newly infected pages a day, a huge increase on the 5000 daily average recorded earlier in the year. About 80 percent of all Web-based malware was hosted on legitimate, innocent, but compromised sites. The June attacks, for example, were launched from more than 10,000 legitimate web sites mostly hosted in Italy.[33]

Armed with an exploit tool kit, attackers launched massive attacks in Europe from the compromised sites, with infections spreading worldwide. Analysts reported the large-scale attack was based on the multi-exploit hacker kit dubbed 'Mpack,' which redirected visitors to a server hosting the professional, Russian-made collection of exploits which then worked against that country's domains. Infected computers were fed a diet of malicious code, largely keyloggers that obtain user names and passwords for valuable accounts such as on-line banking sites.[34]

In its second 'Internet Threat Report for 2007' antivirus vendor Symantec agreed cyber crime had gone professional. Criminals were making complex, highly targeted attacks and selling easy-to-use on-line hacking tools to recruit a new generation of fraudsters.

Symantec found 95 percent of such attacks were on home users and that phishing attacks had increased 54 percent in the first half of 2007, when the company blocked more than 2.3 billion such messages – up 54 percent. A multi-billion economy was being fuelled through these attacks in conjunction with stolen credit cards sold on the Internet for a couple of dollars each.

Symantec consumer spokesperson Trudie Wood said the whole notion of privacy and security was changing. "We're living in an era of more collaboration and on-line interactions, with social networking, wikis, podcasts, blogs, and RSS syndication feeds opening users up to a variety of potential security risks. It is no longer about protecting computers and other devices but protecting the interactions of Internet users. Today's bad guys don't need to pick your locks or break your windows; they attack you and your family over the Internet."

TAKING OUT THE GARBAGE

Spam is annoying not only because much of it is offensive but because of the time wasted sorting through the junk in search of the genuine.

ISPs who don't have anti-spam filters on their systems risk losing business as customers seethed with frustration at the daily dose of junk email. While ISPs and PC users are stacking on the anti-spam technology in an effort to clean up their daily intake, New Zealand remained one of the last OECD countries to enact an anti-spam law.

San Francisco–based anti-spam company Brightmail claimed spam penetration was 8 percent in 2001, but by September 2003 this had rocketed to 54 percent of all email. By 2007 it was estimated more than 80 percent of all email was junk. Individual spammers could broadcast hundreds of millions of email messages daily and all it took was a few responses to make them profitable.

Dominant spam in 2003 ranged from penis enlargement pills to get-rich schemes for the gullible, including appeals from allegedly dispossessed but wealthy people in South Africa or Nigeria wanting bank account details in order to relocate millions of dollars. Then there were the legitimate but annoying pitches for everything from herbal remedies to spy cameras, remote-controlled cars and, ironically, spam removal products.

There was also a stream of advertisements trying to entice the weak willed into the Web's red light districts. In fact porn had become a modern-day plague on the Internet, growing 1800 percent over five years. According to N2H2, pornography-related pages grew from 14 million in 1998 to roughly 260 million in 2003. This came hot on the heels of news that Microsoft was closing down its chat rooms in 28 countries in an attempt to reduce access by sexual predators to children using the sites.[35]

SPAM ENLARGEMENT

The sale of its domain name management company Domainz in 2003 had freed up InternetNZ to tackle the bigger issues including spam, with initial attention focused on Christchurch-based spammer Shane Atkinson. It had referred the case to the Commerce Commission, the Ministry of Health and the privacy commissioner. His activities included selling pills claiming to enlarge penises. Atkinson told both the *NZ Herald* and *The Press* he was unrepentant about his activities and that anyone who didn't want to receive spam should "[not] connect to the Internet, or don't have an email address." *The Press* claimed Atkinson had earned over $300,000 a year but in response to the threat of action he closed his business.[36]

Some outbreaks of spam or virus attacks had been significant enough to slow the delivery of email. While ISP filters were able to sift out 95 percent of the rubbish, it was up to the user to deal with the rest. In 2004 New Zealand's largest ISP Xtra reported it was catching around 60 million spam messages a month, or about 50–60 percent of all inbound email. During the global outbreak of the Zafi.B virus in June, Xtra identified 85 percent of incoming mail as either worms or spam. A paper outlining a proposed anti-spam bill went to Cabinet in early November 2004 but soon slipped down the priorities list. The bill took an 'opt-in' approach for commercial messages, similar to the Australian legislation. In other words there had to be some pre-existing relationship between the sender and

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receiver before commercial messages could be sent.

It was claimed Australian spam levels had halved since the introduction of the Spam Act there – not surprising, with penalties of up to A$44,000 a day for individuals, $220,000 a day for organisations and $1.1 million for persistent spammers. According to Internet security firm Sophos Australia had previously been among the top 12 spam-producing countries. Locally the flood continued to rise. It was even suggested some spammers had moved to New Zealand or at least were using hijacked computers here to spread their trash.

Symantec had acquired Brightmail in June 2004 and was scanning close to 100 billion emails to obtain its research information. In September it said 24 percent of the annoying clutter worldwide was trying to sell products, 16 percent was adult-related material, 17 percent related to financial offerings; health and scams totalled 8 percent each, and fraud 6 percent. The balance related to Internet, political, spiritual and leisure. In Asia-Pacific the mix was similar except for the higher incidence of scams.[37]

In early 2006 global spam volumes continued to increase, and surveys indicated 80 percent of all email was now spam. Spam had also become more dangerous, with many messages secretly containing viruses or other hidden programs that could turn ordinary Internet users with broadband connections into large-scale spammers. The culprits had moved way beyond traditional unsolicited email, hitting millions of blog sites with what had become known as 'splog.' Internet telephony was facing a growing spam problem referred to as 'spit,' and phishing emails, which deceptively send users to phony web sites to extract personal information, were blamed for hundreds of incidents of identity theft.

By mid-December 2006 customers of Xtra and no doubt many other ISPs were getting fed up the decline in email service. There were even threats of legal action against the country's largest ISP. Customers complained that email delays and non-deliveries were severely affecting their businesses. Telecom said the problems arose from the huge amounts of spam flooding the network. In September it claimed to have filtered a record 226 million spam items, compared with 65 million for the same time in 2005.

ISPs INUNDATED

Consumers' Institute head David Russell said home users could claim compensation for email delays if they had suffered 'a real measurable loss' while non-commercial customers were covered by the Consumer Guarantees Act, which said services paid for had to be of a 'reasonable quality.' Telecom did not generally offer compensation for email delays but in 'exceptional circumstances' would consider it. Telecom general manager of consumer marketing Kevin Bowler said the company was spending tens of millions of dollars on anti-spam measures. Ihug had also invested a 'significant amount' on spam filtering after its email network was crippled in late October. At TelstraClear a three-level system to fight spam was proving effective but the battle against spam was almost like waging 'a cold war.'[38]

By March 2007 it was alleged that pornographic spam had dropped to an all-time low as spammers concentrated on health-related products and other general product pitches. According to the

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Symantec report, porno spam comprised just 3 percent of what was arriving in people's email boxes, the lowest ever recorded. About 70 percent of all email messages monitored over the period were spam, half originating from computers in North America. Improved blocking and filtering methods had driven spammers to use new techniques. About 38 percent of the spam email received in February 2006 was contained in images, making it more difficult for security software to detect. They were also using text at upward- or downward-slanted angles to hamper optical character recognition technology, which tries to read the text within images, Symantec said.[39]

InternetNZ had waged a protracted battle against spam, working with other industry groups towards regulation, education, and a code of practice for ISPs. The Unsolicited Electronic Messages Bill it had worked on with other industry groups had a slow passage but finally made it to parliament in the form of the Unsolicited Electronic Messages Act, which passed into law at the end of February 2007. The Act applied not just to email but instant messaging and texting, and would come into force after a six-month amnesty, to allow businesses time to adjust their mailing practices. It was expected to have the greatest impact on local spammers but also enabled the Department of Internal Affairs to co-operate with global agencies, to help stop spam at its source.

The Act aimed to prevent New Zealand becoming a haven for spammers by prohibiting unsolicited commercial electronic messages. It required senders of commercial messages to include accurate sender information and a functional unsubscribe facility. "This legislation enables Kiwis to join the global fight against spam. International co-operation to identify, shut down or block the sources of spam is an important part of our anti-spam strategy," said Communications and IT Minister David Cunliffe. Under the Act, those sending messages were prohibited from using address-harvesting software or a harvested address list to send unsolicited electronic messages.[40]

Under the new law, which aligned with Australian regulations, unsolicited commercial messages were banned, along with any message that used a link to hide its content. An opt-in permissions environment applied; messages could only be sent at no cost and only if you explicitly agree to accept them. If someone chose to unsubscribe it had to be acted on within five days. There were significant penalties for offenders, and strong powers to assist the Department of International Affairs (DIA), including search and seizure provisions. The DIA would operate a central email address for reporting spam and sex-related material. Penalties for breaching the Act ranged from formal warnings to infringement notices and court actions, with a maximum fine of $500,000 for an organisation or $200,000 for an individual. Spammers could also be ordered to pay the victim's compensation up to the amount of loss suffered and/or damages up to the amount of profit that was made as a result of sending the spam.

The anti-spam law, however, attracted its critics, who claimed it would do little to combat the millions of unwanted messages sent to inboxes each year, as most of the junkmail came from offshore. ACT leader Rodney Hide said the law was well meaning but would place extra costs on small businesses wishing to market their services. ACT's

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two MPs were the only ones to vote against it. Hide said the law would also fail to stop spam which could be better combated through filtering. National MP Chris Auchinvole said although National supported the legislation as part of international efforts to tackle spam, it would achieve very little in the near future. "It's more virtual than real and in reality it does virtually nothing."

But Cunliffe said the law contributed to an international crackdown on spam. It was important New Zealand was not seen as a soft touch for spammers. "This law is another important step towards greater Internet security. It will clamp down on spam of a domestic origin and provide a platform for seeking an international agreement to fight spam worldwide." Up to 80 percent of email traffic was now spam, he said.[41]

CO-OPERATIVE SOLUTION

The original 'Spam Bill' required a Spam Code of Practice but the revised version which passed into law deleted those references. "We still think it's a useful guideline to have a best practice statement rather than a code of practice. It spells out what you can and can't do in fairly plain English as opposed to the law which is legalese," said InternetNZ chief executive Keith Davidson. "There's nothing there to punish ISPs who might allow spam, but then why should there be, as the ISP industry in New Zealand has already shown zero tolerance for spam. They won't hesitate to chop off accounts that spam." Davidson said ISPs were already self regulating and the Code of Practice would simply give them a bit more of a guideline.

If the law had passed in its original form, ISPs would have been required to provide customers with information on complying with the act: how to minimise and report spam, install spam filters, recognise 'false positives' and how to lay complaints with the enforcement agency. Updateable spam filters would need to be provided either directly or indirectly by ISPs. Each ISP would be required to have a detailed acceptable use policy around email, and identify consequences for a spam breach. They would also need to co-operate with law enforcement and provide 24-hour contactability in case urgent action was needed to knock out spam. ISPs would be required to close down open relays and open proxies, and retain IP assignment information for 28 days. They would also need to provide a free formal complaint handling process and maintain an email abuse reporting address.[42]

The replacement approach for this high level of responsibility, the ISP Spam Code of Practice, was launched in September, outlining a strong self-regulatory model. The 'best practices and procedures' approach included spam complaint-handling procedures developed parallel with the Unsolicited Electronic Messages Act, and endorsed by InternetNZ, the Telecommunications Carriers Forum, the Marketing Association and ISAPNZ (the ISP Association).

Davidson said the code was a key component in the overall fight against spam, along with regulation, education and co-operation with international enforcement agencies. "As the vast majority of spam in New Zealand comes from overseas servers and is beyond the scope of the legislation, it is unlikely consumers will see any significant reduction. However it critical that New Zealand plays its part legislatively and technically to reduce the incidence of spam."

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ISPANZ president Jamie Baddeley believed it was an important step towards a more robust Internet. "It establishes a good baseline to build upon and is one of the many ways for New Zealand to say that we're doing the right thing here."[43]

Meanwhile, worldwide spam levels continued to rise, comprising around 70 percent of total email messaging by September. Spam – unwanted, unsolicited electronic junkmail – was tailing off but escalated again from mid-year. Auckland anti-spam company SMX said by August the number of spam messages hitting New Zealand email systems was 100 percent up on May and 50 percent up on the previous record set in January 2006.[44]

MALWARE HERE TO STAY

Attackers were increasingly turning to end-user systems as a way around the antivirus and firewall systems that were blocking access to traditional attack routes. Software developed and deployed by Wellington's Victoria University that helped track Web-based security attacks as part of the international Honeynet Project revealed that even seemingly safe Web addresses were rife with attack code aimed at vulnerable clients.

According to the researchers in the Unites States, Germany, and New Zealand, "The 'black hats' are turning to easier, unprotected attack paths to place their malware onto the end-user's machine." The authors of the 'Know your enemy: Malicious Web Servers' study released in August 2007 used a 'high-interaction' client honeypot, called Capture-HPC, developed by Victoria University, to analyse more than 300,000 addresses from around 150,000 hosts. It looked at various site categories, including adult, music, news, 'warez'[45], spam, and addresses designed to grab traffic from users who mistype common Web addresses. While some categories were more likely to contain malicious addresses than others, all contained malicious addresses, the report said. "As in real life, some 'neighbourhoods' are more risky than others, but even users that stay clear of these areas can be victimised," it said.

Users could be led to malicious sites via links, typing in an address manually, mistyping an address, or following search results. The results only served to confirm what security researchers had been saying all along. Regularly updated blacklists and regular patching helped; however there was a prevalence of attacks against plug-ins and non-browser applications. "Attacks also target applications that one might not think about patching, such as Winzip," the study said.[46]

In the first week of December the *Weekend Herald* broke the story of a $26 million computer fraud perpetrated on over a million computers by an 18-year-old from Whitianga. Owen Wilson described as a 'brilliant' loner who got himself into a computer scam for a bit of fun, was tracked down by the FBI, the US Secret Service, Dutch authorities, and police in New Zealand and had his equipment seized. It was alleged he had control over a vast 'botnet' network of computers that cyber-criminals paid to use.

Wilson, who had used the name AKill and the alias Snow White, was tracked down after an 18-month investigation and was believed to be part of 'an elite international botnet coding group.' The FBI said his activities went beyond malicious and that he was also behind an attack in February 2006 that brought the computer network at the University of Pennsylvania to a halt denying access to 4000 students and staff and infecting 50,000 computers with a virus that was undetectable to anti-viral programs. He was also allegedly head of a team involved in an illegal adware scheme which infected 1.3 million computers, that Dutch authorities were investigating.

World-respected Kiwi security expert Peter Gutmann saw no end to the proliferation of hacking and malware, and plenty of work ahead for anyone wanting to get involved in the security industry. While systems had become a lot more secure since the 1990s, the attacks had also become smarter. "They are now being run as a commercial software business; for example by Eastern European organised crime rings who put a huge amount of money into their efforts. The bad guys are now hiring extremely skilled programmers, and because there are now good spam filters in place, they're paying people with PhDs in linguistics to work around them, which is outrageous. These are serious opponents with better experts than the good guys." The industry was no longer dealing with teenagers sitting in a basement cracking code and out for a joyride, but "seriously huge organisations" that produced well-written, bug-free code which is tested across multiple machines and platforms, said Gutmann.

In the mid-1980s, at the age of 14, Peter Gutmann designed and built his own computers. He first got involved in the bulletin board community through a school friend who ran one from his Auckland basement. He would chat on-line, exchange information, and hang out with 'a random cross-section of people who you would never otherwise have got to meet.' At Auckland University he focused on computer science, obtaining a master's degree with a thesis on data compression. On realising he could only ever hope to achieve 'half a percentage of improvement' he shifted his studies to the equally arcane field of security, studying for a PhD for his work on the design and analysis of security techniques and systems. His early achievements included the creation of full-strength encryption systems. He said a good dose of paranoia was important in figuring out all the possible attacks and the security problems.

There were enough people breaking into systems, so Gutmann took on the role of defender. "I was always interested in looking at all the ways someone might attack a system. I like thinking up weird attacks and setting up counter measures." In those early days, he said, there was a relatively small hacker community in New Zealand, compared to what was happening in the United States or Europe. "The people I knew were mostly doing it for a joyride – 'Look at me. I'm really cool' and that was it. Mostly they found girlfriends, got married, had kids and settled down. That's the best cure for teenage hackers; they get a life and stop doing it."

Over the years he claimed to have broken the password, file encryption, and security systems of a number of Microsoft, Netscape, and Norton products soon after release. He took credit for breaking the code for the Yellow Bus Company smart cards by creating a $50 test card that was accepted by the bus readers, before he informed the company of the security problem. With the growth in e-commerce and increasing transfer of sensitive information, his skills were increasingly sought after.

Gutmann was regularly called on to address international security gatherings. He moderated several Internet security and encryption newsgroups and contributed to the development of world security standards, including international public key encryption. He developed the open source Cryptlib security tool kit and security library, which attracted a lot of public attention. He was prevented from legally selling it because of its military-grade nature, so he gave it away. Users included a number of hospitals, medical laboratories, and doctors throughout New Zealand. He also contributed to PGP (Pretty Good Privacy) version 2, and devised the 'Gutmann method' of secure erasure of data from magnetic media.

In the early 1990s, after a period of employment with Orion Systems health software firm, he became more deeply involved in security work through his own company Digital Data Security. His controversial white paper 'Cost Analysis of Windows Vista Content Protection' described the content protection specification in Microsoft's new operating system as "the longest suicide note in history."

In the end, he said, there was little anyone could do to keep safe on-line other than ensuring security and antivirus software is up to date. As far as legislation goes, is like asking what the government can do to stop people getting sick. "There are so many facets; you deal with one and another hundred appear. There is no silver bullet." Besides, most of the attacks and the malware came from overseas, and even tracking down the source is almost impossible. "Most of it is done through hijacking PCs from a third party. They might be using your granny's computer which is infected with a hundred types of spyware."

His only suggestion was for legislation to prevent software being sold here with insecure configurations that make a PC open to attack or infection by a third party over the Internet. However most software came from the United States, so anything the government did here was not going to have much effect, Gutmann said.[47]

New Zealand Police were adding new tools to their artillery to clean up on-line crime. There had been a rapid evolution of electronic crime both in New Zealand and overseas, and while there are close links with Australia and other jurisdictions, since 2002 the police were ramping up their own e-crime strategy. "Crime is being increasingly committed in what is effectively the cyberspace Wild West, a borderless environment where traditional policing methods are often no longer effective. This is the high end of new electronic crime: anonymous, borderless, fast, dynamic and incorporating ever-changing and sophisticated technologies," said Police Commissioner Howard Broad.

The new Police Electronic Crime Laboratory in central Wellington now employed 14 staff using state-of-the-art equipment to crack down on criminals using the Internet. Over five years the e-crime lab would align with a National Cyber Crime Centre (NC3) for a single reporting point for e-crime targeting and electronically patrolling places where crime occurs, with a strong focus on organised crime, violence, and child exploitation.

Commissioner Broad cited the police partnership with NetSafe, the charitable organisation aimed at keeping children safe on the Internet, as the way of the future in developing a combined-agency approach to e-crime. "We cannot effectively address these sorts of issues alone. The problem is too big, too complex and we don't have the technical resources necessary to respond to what is rapidly becoming a significant problem without joining up with other agencies."

As part of the strategy, Project Eve (Environment for Virtualised Evidence) was set up to make it easier to process electronic evidence; for example, converting computer hard drives into virtual images, allowing detectives to access evidence at their desktops rather than waiting for forensic investigators. Expected to cost several million dollars, it aimed to bring an end to investigations and court cases which could sometimes last as long as a year. "The amount of work has increased and completely overwhelmed us and we have been in the position where we have not been able to deliver the evidence in a timely manner and that is why we are making those changes now," said national e-crime laboratory manager Maarten Kleintjes.[48]

Software piracy, hacking, and cracking continued to escalate, and the Internet made traditional crimes such as drug trafficking, paedophilia, and fraud much easier. The law could only do so much. With cyber criminals becoming smarter, and new kinds of net nasties proliferating, the responsibility increasingly sat with the on-line community to ensure their systems and personal information were protected while remaining alert to any signs of unusual activity that might suggest criminal activity was in progress. Co-operation was clearly the key with schools and parents, members of social networking communities warning each other about potential threats, and governments working together to eliminate spammers, terrorists, and child molesters.

COMMON TERMS

Hackers (allegedly hack only) or crackers (more criminal element): Unauthorised visitors to other people's computers or networks. Many hackers are content with simply breaking in and leaving their mark; others maliciously crash entire computer systems, stealing or damaging confidential data, defacing Web pages, and ultimately disrupting business.

Viruses: Computer programs designed to replicate themselves and infect computers or modify or damage files. Infection can occur through shared disks or over a network, including the Internet. Virus action may often be triggered by a specific event. Some viruses are relatively benign, causing annoyance and inconvenience including slowing down systems by taking up important computer memory; while others are malicious, destroying or deleting files, or reformatting hard drives.

Trojan horse programs: Programs which are delivered by email or caught from Web pages and appear harmless until triggered. They may contain destructive code which can attach to an operating system and delete data, or exploit weaknesses in computer software, or networks and open up systems for additional attacks. Many come with their own email capabilities, to search for and mail themselves out to email address lists.

Reconnaissance or scanning attacks: Information gathering activities where hackers collect data, typically through port 80 on the computer, which can be used later to compromise networks. Usually, software tools, such as sniffers and scanners, are used to map out network resources and exploit potential weaknesses in the targeted networks, hosts, and applications.

Access attacks: Conducted to exploit vulnerabilities in authentication services and FTP functionality in order to gain entry to email accounts, databases, and other confidential information.

Password attacks: A perpetrator gains unauthorised access to network passwords in order to penetrate confidential information – historically the most common type of attacks. When a hacker cracks the password of a legitimate user, he has access to that user's network resources and typically a foot in the door for gaining access to the rest of the network.

Denial of Service (DoS): These flood applications or servers with traffic in order to deny access to legitimate users. They tie up system resources, and are usually initiated by hackers sending large amounts of jumbled or otherwise unmanageable data to machines connected to corporate networks or the Internet.

Distributed Denial of Service attacks (DDoS): Where an attacker compromises multiple machines or hosts.

Root access attacks: With root access, the hacker has full control of the system and can often collect enough information to gain access to the rest of the network and other partner networks.

Spam: Unsolicited, unwanted junk email sent to a user's mail box which can clog up the ISP mail system on a bad day or waste a user's time sorting through what is valid and what isn't.

Phishing: Scams, often posing as a bank or a legitimate message from a trusted party, trying to convince people to disclose sensitive personal information including log-in password and other account numbers.

Internal threats: While most attempts to prevent security breaches are focused on the world outside, internal threats, particularly in the business sector, are

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very real. For example, choosing easy-to-use passwords makes it easier for others to break into a computer or network. Bringing in floppy disks, CDs, SD cards, or laptops from outside the business can spread viruses. Disgruntled employees can purposely steal data, infect systems, or write code that can cripple software after they have left a company.

OPPORTUNIST VS MOTIVATED HACKER

The opportunist hacker looks for the easy score, exploiting known vulnerabilities and may simply be looking for recognition. He or she may deface Web pages, create a Trojan or a virus with the aim of maximising the nuisance factor so they can brag about it. Often referred to as script kiddies, warez pirates, and black hat hackers. The motivated hacker wants to get you. They are usually looking for revenge and may take the form of a disgruntled employee, ex-employee, dishonest employee, temporary employee, after-hours cleaner, or dissatisfied customer. They will take their time to discover everything they can about your organisation and use tools such as NSLOOKUP, Whois, password cracking applications, and interrogate mail headers for information. They will check your web site for error information that inadvertently gives away important security details. The motivated hacker will plan their attack down to the last detail, they are patient and meticulous and if they are successful, you may lose everything.[49]

NOT SO BLACK AND WHITE

White-hat hackers, as they are often called, are highly paid consultants hired by the corporate industry to track down crackers and help discover security holes. Black-hat hackers are individuals who exploit security weaknesses with malicious intent.

According to the *Hacker's Jargon Dictionary*, the hacker was originally someone who made furniture with an axe. The definitions for the digital hacker range from a person who enjoys exploring the details of programmable systems and how to stretch their capabilities; one who programs enthusiastically (even obsessively), to an expert or enthusiast who enjoys programming or can program quickly. They might be an expert in a particular program such as Unix. One who enjoys the intellectual challenge of creatively overcoming or circumventing limitations. A hacker might also be a malicious meddler who tries to discover sensitive information by poking around; for example, password or network hackers. The preferred term for this kind of activity is, however, cracker: one who breaks security on a system. The term was allegedly coined in 1985 in response to journalistic misuse of the term 'hacker.'

"While it is expected that any real hacker will have done some playful cracking and knows many of the basic techniques, anyone past larval stage is expected to have outgrown the desire to do so, except for immediate, benign, practical reasons (for example, if it's necessary to get around some security in order to get some work done). Thus, there is far less overlap between hackerdom and crackerdom than the mundane reader misled by sensationalistic journalism might expect . . . though crackers like to think of themselves as hackers, most true hackers consider them a lower form of life," says Eric S. Raymond in his 'How To Become A Hacker FAQ' in the *Hacker's Jargon Dictionary*.[50]

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Bitstream boundaries

Sorting out speed bumps

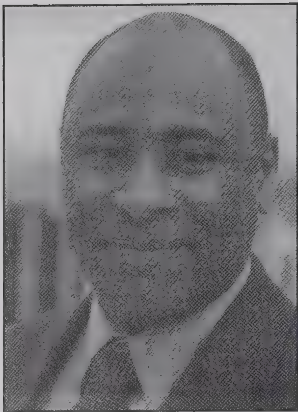
> Until a critical mass of New Zealanders use broadband on a daily basis, and experience firsthand how it can enhance their lives – convergence will just be a lot of hot air … From now on, our focus will be on providing content and services tailored for the broadband environment in an integrated way, enriching customers' experience on Telecom's next generation Internet protocol network.
> Simon Moutter, Telecom chief operating officer, April 2003[1]

In the early days of the communications revolution the mantra was one of decentralisation where new digital highways would encourage regional and rural development, empower small businesses, and stem migration to the cities. The hope was revealed as hype when telecommunications competition became focused on wealthier suburbs, industrial parks, and the CBDs of major cities.

Post offices, banks, government departments, and businesses continued to withdraw from the provinces leaving ghost towns in their wake. We were the first nation in the world to fully deregulate telecommunications, but our carriers squandered their global edge squabbling with each other over who had rights to what, more interested in pleasing shareholders than closing the digital divide. They were still arguing over interconnection costs, equitable access to Telecom's last mile and number portability 15 years later.

Attempts by government to speed things up had rarely produced results. Communications Minister Paul Swain promised outlying communities would have access to "the same kind of two-way, high-speed Internet available to those in major cities" by the end of 2003. His predictions of early 2002 were revised to the end of 2004 and continued to slip away.[2]

Farming remained the backbone – the engine room for the New Zealand economy – but was clearly disadvantaged without speedier access to the growing number of on-line services that supported that industry. An OECD report from December 2002 suggested the dairy industry might achieve productivity gains of up to $280 million if the right applications and tools were available to farmers over the Internet. An AC Nielsen survey found 63 percent of farmers with a gross income of more than $100,000 had access to the Internet; with dairy farmers it was closer to 80 percent.



Sean Weekes, general manager of Iconz.

It was estimated about 300,000 users visited an agricultural web site each month. Their enthusiasm for the Internet was, however, understandably curbed by a copper wire infrastructure that operated at a less than optimum 9.6kbit/sec for their dial-up connections. Telecom had committed to upgrade its network to 14.4kbit/sec across most of the country, however, that was still considered traction engine speed for Web access.

The government-led Project Probe (Provincial Broadband Extension) offered about $100 million in state funding to subsidise additional infrastructure for schools, and ultimately remote communities, to help close the divide. Having equivalent broadband access to their city cousins would open the way for a new level of services such as interactive learning, videoconferencing, moving X-rays between health services, and more rapid access to essential market services for the farming community.

Swain was certainly eager to put some legs under his promise of broadband for everyone and continued to place TVNZ-owned Broadcast Communications Limited (BCL) in the front line, insisting it provide all carriers with access to its nationwide wireless network. BCL had the ability to extend its 'last mile' capability (256kbit/sec for inbound traffic and 128kbit/sec outbound) to the majority of the country, where copper was incompetent and satellite unsatisfactory. However BCL, which provided transmission capabilities for every major radio and TV channel, said it needed a good business case before it acted.

It had invested $100 million in upgrading its data network to a fully digital microwave backbone, capable of 155Mbit/sec, and a bidirectional wireless local loop access platform from Airspan. It formed several arrangements to deliver voice and data services to 14 outlying regions as part of Project Probe, but the ideal business partner was Telecom. The initial focus was on 2700 schools, with a view to leveraging this access to deliver better quality voice and data services to 200,000 rural customers who were struggling with sub standard communications.

DIY BROADBAND

Walker Wireless (soon to become Woosh) was keen to get a slice of this business, and in conjunction with Vodafone was testing technology to deliver speeds of up to 3Mbit/sec over a range of 30km from base stations. During 2002 a number of regional councils and community trusts gained support to attract broadband suppliers. High-speed access was delivered to a dozen Otago towns and every secondary school. Electricity suppliers such as Counties Power were promising 25,000 residents and businesses on the outskirts of Auckland would have independent broadband access.[3]

While consortiums of wireless and wired carriers continued to bid to provide broadband to schools and remote communities as part of Project Probe, several local authorities, community trusts and private groups, including those in Northland, Wairarapa, Taranaki, and Southland, had made independent headway. Venture Southland, for example, was born from sheer frustration when the region was bypassed by Telecom's DSL roll-out, often leaving the rural sector with speeds as slow as 500bit/sec or 2–3kbit/sec – hardly enough to maintain an Internet connection.

Southland produced 'Blazing a Trail for the Information Highway,' a regional assessment with insights into consumer needs, to help commercial players going to tender. Walker Wireless and Vodafone won the contract to deploy 128kbit/sec or faster services to 95 percent of the population

for an undisclosed investment. That independent move kicked Telecom into gear. It rapidly deployed JetStream and BCL's wireless technology throughout Southland, with promises it would reach 80 percent of rural New Zealand households by June 2004.

Venture Southland special projects development manager Steve Canny was in no doubt the alternative solution forced Telecom's hand. Venture Southland was swamped by inquiries from other regions wanting to know how it got its way. "Community leaders have a key role to play in the area of telecommunications. Bandwidth is critical to economic development. Unless you have a competitive environment you will always suffer from a lack of effective communications and reinvestment in existing networks." The pricing of bandwidth, he said, was a huge obstacle to the traditional telco model and there was a need to move to open access type networks where users paid for access, not megabits.[4]

Tony Van Horick, who headed up Project Probe.

Paul Swain initially suggested he might require government departments, local authorities, and schools to bundle their communications needs to attract the best deal. However Project Probe director Tony van Horick explained no one could actually be forced to sign up. While schools were keen to embrace faster networks, to use the Ministry of Education's management information records (MIR) for example, they still got to choose which network provider they went with. The Ministry of Health was willing to be involved in the wider roll-out of broadband, but it and other government agencies and local authorities could remain with existing suppliers or find new carriers based on their own criteria.

ISPs' SHAKE-UP AND SHIFT-OUT

As the ISP market underwent further consolidation, many smaller players were facing an identity crisis, caught between Telecom and TelstraClear and ramping up their own IT and outsourcing offerings. Meanwhile software developers, systems integrators, and IT firms were adding Internet connectivity to their armoury.

By the end of 2001 Telecom claimed it was owed $20 million by ISPs, a strong indication many were struggling to survive in an increasingly tough market. Telecom had accelerated its efforts to reclaim the accounts, many of which were overdue by more than 90 days. It had been owed a similar amount the year previously, but the market had taken a turn for the worse in the past six months, said Telecom's general manager of industry services Greg McAlister.

He said Telecom had written off $1.5 million in debt since mid-1998 through ISPs going into liquidation, and to June 2001 just under a million dollars in bad debt was owed. That situation was unlikely to improve anytime soon. One in four of Telecom's ISP customers had difficulty paying on time.[5]

The number of ISPs had more than halved in the five years to 2003, but the market space they contended for was growing. Annual ISP revenues were more than $300 million and Australian commentator Paul Budde suggested their slice of the overall telecommunications market could be far greater if they lifted

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their game. He estimated the market was worth around NZ$6 billion and likely to stretch to around $15 billion by the end of the decade.

How much of that went to ISPs would depend on how professional they were and whether they could excel in broadband-based customer service including video-on-demand, 'tele-education, tele-health, community and regional services, games on-line and network delivered applications.' Their future success would also depend on wholesale access to Telecom's broadband network on commercially viable terms, and whether or not Telecom was forced to unbundle the local loop, giving ISPs more freedom to build innovative solutions.

The battle for subscriber loyalty was heating up as ISPs sought to seduce consumers with increasingly attractive plans for flat-rate or low-cost dial-up surfing. Most PCs came bundled with a 56k dial-up modem and typically Internet subscribers used the Internet at home and work. Many people had multiple email accounts, and many email accounts had multiple users; Internet cafes were springing up in every town and mobile Internet use was growing rapidly.

WORLD-LEADING INTERNET USE

An international survey of 31 countries confirmed New Zealand's high level of Internet use. The GO2002 survey found 71 percent of New Zealanders used the Internet in November 2002, higher than Australia, Britain, and the United States. In December, Neilsen Media Research said three quarters of all Kiwis over the age of ten – about 2.4 million – had Internet access. That was 20 percent up on 2000. A quarter were apparently logging on daily for email, travel, and related services or listening to music.

According to IDC Research, about 40 percent of homes (1.6 million users) had Internet access in 2002, up from 200,000 on the previous year. If you added business users, including those with a home office, the penetration might be closer to 60 percent. IDC believed home use would grow exponentially to 2.6 million by 2006. The top ISPs, by subscriber accounts, were Telecom-owned Xtra (450,000), TelstraClear, which owned Paradise.net (100,000) and ClearNet (150,000), Ihug (150,000), and Iconz (37,000), which together shared about 85 percent of the market.

In the next tier were those with 10,000–30,000 subscribers, including Orcon Internet, Maxnet, Slingshot, Quicksilver, Actrix, PlaNet, Compass Net, Iprolink, and Wave. The balance typically had fewer than 5000 users, either operating regionally or in the niche business or hobbyist market. Those without a solid business model or financial base, and with customers who spent less than $300 a year, were rapidly headed for obscurity. When Internet penetration reached 50–60 percent, as it had in New Zealand, the challenge was to innovate and continue to invest in new equipment and services, then push past slowing profits into the next phase of growth. This challenge fell particularly to the second- and third-tier ISPs, who were being forced to reinvent themselves or risk being gobbled up in the next round of acquisitions as dominant players sought to acquire their customers, databases, and skilled people.[6]

In 2004 New Zealanders continued to have one of the highest penetration rates for Internet use in the world, with 79.8 percent of us connecting from home, school, work, libraries, or Internet cafes. Figures for the second quarter were up 2.7 percent on the same period

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for 2003. Not so encouraging was the realisation that about 90 percent were still on dial-up connections.

Mark Ottaway, managing director of Nielsen NetRatings, thought market growth was slowing, with 61.3 percent of New Zealand homes having Internet access, up from 58.4 percent in 2003. Xtra remained king of the castle with 49.7 percent of home users, TelstraClear and its ISP Paradise.net and ClearNet had a 23.3 percent share and Ihug had 7.9 percent. The remaining 10 percent of the market was shared by about 120 regional ISPs including niche or small town players, servicing fewer customers or specialising in areas like on-line gaming.

High speed Internet access was lagging. Only about 50 ISPs offered a solution, the majority reselling Telecom's digital subscriber line (DSL). Telecom claimed to be adding customers at a rate of 2000 per month. Woosh, Wired Country, and several other niche players offered wireless broadband in a market segment that was growing rapidly and an increasing number of people were using cellphones or PDAs to access the Internet.

Cecil Alexander, director of sales and marketing with WorldxChange, was a relative newcomer to the Internet provider market, having traditionally been involved in tolls. The company was bundling its Xnet service to its 50,000 tolls customers and the wider market. "The vast majority of New Zealanders will probably remain happy with dial-up until such time as access costs to broadband are low enough. While broadband is important to the country your grandmother doesn't really care," he said.

WorldxChange was offering an all-you-can-eat dial-up service with five email addresses, 100Mb of email storage, 5Mb of personal Web storage and antivirus and spam filtering for $20. "We're ready to move into the broadband market but there too many unknowns at the moment. Telecom is actively promoting their stuff heavily before the rest of us get a shot at it."

UNSEEMLY SCRAMBLE

Not only were higher speed accounts and e-commerce skills becoming the great differentiator, there had been a spate of acquisitions and mergers and price wars as consolidation continued. Wellington-based ISP Paradise had been founded in November 1997 by businessman Shane Cole. After rapid growth in a dial-up service it expanded to Auckland and Christchurch in 1998. It gained a reputation for reliability and good customer service and entered into a reseller agreement with TelstraSaturn. That meant customers who subscribed to TelstraSaturn's cable telephone and cable TV service could also get Paradise dial-up or cable modem service included on their phone bill.

Nationwide dial-up access was provided in 1999, and Paradise became one of the first DSL providers after Telecom Xtra. In late 2000 the company was sold to TelstraSaturn for an estimated $30 million, and relocated to its new purpose-built call centre on Wellington's waterfront. The Paradise brand was retained, even after the purchase of TelstraSaturn by Clear Communications in December 2001. The 24-hour helpdesk was merged with that of ClearNet in Auckland. Between them Paradise.net and ClearNet had the second largest number of Internet subscribers in New Zealand.[7]

Cole continued to invest in technology, namely Angel, a service for maintaining mobile phone contact
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details on-line. He also ran LAN Place, a networking gaming centre in Wellington with a gigabit link for Internet and remote gaming access. LAN Place featured low lighting, comfortable chairs, refreshments, and sophisticated network support and was set up in an office building in the heart of Wellington to accommodate 80 or more on-line gamers at a time. The rumour was, when Cole sold LAN Place he bought a Lamborghini and on the way to Auckland got himself three speeding tickets and nearly lost his licence.

In October 2001 when Asia On-line's parent company placed the New Zealand branch in voluntary liquidation along with its Australian and Hong Kong counterparts, there was a flurry of activity with ISPs fighting for a share of its user base. "Every man and his dog who had a server seemed to think they'd be capable of hosting us," said TradeMe's managing director, Nigel Stanford, an Asia On-line customer. Another ISP, StrongNet, ran into trouble with DNS company Domainz for spamming Asia On-line customers.

Meanwhile Voyager, with 11,000 active subscribers, had split into corporate and consumer divisions in late 1999. Voyager, a partnership with Australian ISP OzEmail, itself now owned by Worldcom[8] MCI, decided to pull out of the local residential market late in 2001 and divest its customer base. It was now going after the WAN space, offering managed services where large businesses required lots of bandwidth and security, along with support and servicing. Voyager had offered its domestic users the chance to move to Telecom Xtra's service with no registration fee where they would be able to use their existing email addresses for six months.[9]

The troubled local arm of struggling international brand Asia On-line also began competing for Voyager customers, offering three months' free access. However Xtra seemed to have won the bulk. Telecom's Internet and directories business, employing about 1000 people, had become a star performer among the company's four divisions. Xtra's revenues, $49 million in the half-year to 31 December 2001, were up 36 percent over 2000, with a 34 percent increase in its user base to 335,000.

The gains were made despite criticism of Xtra bumping up the price of its flat-rate Internet offering and removing a popular pay-as-you-go scheme. Consumer general manager Rod Snodgrass said the continuing recession in the PC market failed to dent growth, which had been boosted by the acquisition of an undisclosed number of Voyager customers. Xtra had about 20,000 customers using its JetStream or JetStart high-speed Internet services, which CEO Theresa Gattung said experienced a combined take-up rate of 1500 per month. Those services contributed to earnings of $14 million in the half year to December 31, up 250 percent on the same period in 2000.[10]

BUY, SELL, AND EXCHANGE

In 2002 the ISP industry shakedown continued as smaller players struggled to find their way against increasingly consolidated contenders. As bandwidth became commoditised, the focus shifted to service and services. Business customers in particular were more concerned about the quality of connections and added value; for example, development skills, secure hosting, and e-business applications that could connect customers and partners

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to transaction-capable web sites and back-end systems and processes.

The local assets of Asia On-line were bought by Dresden Equities, the country's largest private company, majority owned by the Spencer family and associated with businesses as diverse as Toyota New Zealand, Caxton Paper, and Equitable Insurance. Michael Spencer's Internet Corporate Solutions,[11] already owned several ISPs throughout New Zealand – Ezysurf, Esurf Wireless, Virtual ISP, and Jafa. When it placed the highest bid for the remaining business of the failed Asia On-line operation, liquidated in October 2001, it picked up 10,000 residential customers and 3000 business customers, Spencer's customer base was boosted to around 40,000.[12] Iconz had been purchased by Asia On-line in 1999 but since that time had undergone several management changes and a restructure, reverting to the better known Iconz name in November 2001.

Spencer was convinced 95 percent of existing ISPs in the market weren't making any money. "I would be very surprised if there were more than a dozen strong players in this market in 18 months … Eventually their shareholders will want an exit strategy." A study released in early January 2002 by the Australian Bureau of Statistics showed 115 ISPs had ceased trading there in the year to September. New Zealand had more than 80 operational ISPs but the top four still accounted for more than 70 percent of the dial-up market.[13]

At the helm of Iconz for its new growth period from 2003 was managing director Sean Weekes, who had migrated from Britain initially to work for Compaq New Zealand.

At the beginning of 2003 Iconz had 20,000 residential customers and 11,000 business customers, making it the third largest ISP in that sector. The company now employed a staff of 50, plus a research and development team of five. It had made good inroads into the business community, and was on the comeback trail under new ownership. It now referred to itself as an ISP and had broadened its offerings to include equipment leasing, co-location or tele-housing and end-to-end connectivity. What it couldn't offer directly it delivered in conjunction with partners.

"The biggest challenge is to ride the stormy waves of consolidation while maintaining quality of service," explained Weekes. "If ISPs really understood what it costs to deliver a dial-up or DSL service to a customer then the pricing in the market would change. Dial-up is not 'cheap as chips' – the modem banks, back-haul line, and customer servicing cost about $26 a month per customer. A lot of companies can only get away with $10–$15 a week if people exceed their data cap or if they have a good mix of corporate customers."[14] Like the other ISPs in the market, it was eager to make the most of any determination by the telecommunications commissioner that would improve interconnection rates and wholesale access to Telecom's network for independent broadband services.

Another pioneering firm, under new management from September 2003, was Ihug, which sold for $81 million to Perth-based Internet provider iiNet. The Australian company was actively placing its equipment into Telstra's local loop exchanges, and had become the number two DSL provider across the Tasman following unbundling legislation there. This was consummation at last, after several attempts by Ihug management to sell off the company saw it jilted at the aisle. In May 1999 Sky Network
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Television announced it would take a 30 percent interest in Ihug, with an option to buy a further 15 percent, but the deal fell over due to a disagreement on future directions including, according to one source, the Wood brothers pay packets. Apparently they wanted $500,000 each with ten weeks' leave.

Another merger proposed with Force Corporation collapsed in 2000.[15] The decision by Ihug to lease additional satellite bandwidth as a hedge against the late arrival of the Southern Cross cable had cost it short-term profits and spooked Force Corporation shareholders. In April 2000 when the acquisition was up for approval it was disclosed Ihug now had 220Mbit/sec of international capacity, including 90Mbit/sec for wholesale customers, which had contributed to a projected loss of $2.5 million for the six months to 30 June 2000. Its lease commitments through to 2004 totalled US$33.4 million according to a memorandum sent to Force shareholders, who were warned the commissioning of the Southern Cross cable might lead to a reduction in the cost of international bandwidth.

Ihug's financial performance had also taken a substantial hit when both Xtra and Clear had introduced flat-rate Internet prices below those offered by Ihug in mid-1999. Outlined in Ihug's business plans were an intention to purchase smaller Internet-related businesses in both Australia and New Zealand.[16]

Two days after effectively being rebuffed by Force Corporation, ISP Ihug had taken 51 percent of the 115-store Video Ezy chain, which claimed 35 percent of the local rental market. The deal was part of Ihug's on-line strategy to allow customers to have a life outside the Internet by ordering goods on-line. Director Tim Wood said it was foundational to its e-mmediate delivery system, an e-commerce fulfilment system where the goods would be delivered to customers within half an hour. Talks were apparently progressing on a number of fronts about what might be delivered. However Wood conceded the video rental business was past its peak and there were many challenges ahead with the arrival of pay-per-view systems and new technology.[18] Within a year Video Ezy was sold back to its original owners.

Ihug maintained steady growth in a turbulent market but always seemed to keep a step ahead of its competitors through innovation and sometimes sheer bullishness. At the beginning of 2003 it had around 150,000 customers across Australia and New Zealand and was number three rated ISP in New Zealand. Xtra, ClearNet and Ihug between them had 80–90 percent of the country's 800,000 Internet users, according to telecommunications analyst Paul Budde.[19]

The cash component of the deal with iiNet was worth A$30 million, with the balance made up of 24 million iiNet shares at A$1.75 per share to Ihug's shareholders including the Wood brothers, their father John Wood, Bart Kindt, and CallPlus owner Malcolm Dick. The acquisition revealed, for the first time the size of Ihug's business. It had been generating annual revenue of A$48 million from its 170,000 customers on both sides of the Tasman, and appeared to be a relatively profitable company, earning A$10.8 million net profit for the June 2003 quarter alone.[20]

UNDER NEW MANAGEMENT

After the sale, a restructure saw Ihug settle into much more of a business

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focus as a carrier and an ISP, reselling fibre, frame relay, DSL, tolls, and other services. This was a shift away from the eclectic adventures of the entrepreneurial Wood brothers, who had founded the firm in 1995 and always had an eye out for the future, experimenting with pay-per-view video distribution over satellite, e-commerce, and a range of other leading-edge plans, including developing their own set-top box, which never made it to the market.

The new owners were lobbying for unbundling, promising Ihug would ultimately deliver its own service if it was given access to Telecom's network. Michael Malone, managing director of iiNet, said unbundling had been behind iiNet's fourfold growth in Australia in 2002–2003 and New Zealand was lagging in broadband. Heading Ihug in New Zealand was former Telecom Company Secretary Martin Wylie, appointed in February 2002 after the departure of the Wood brothers. Two years later Wylie abruptly quit the company just as iiNet reported a profit, and made another acquisition to expand its influence along the east coast of Australia.

Wylie denied rumours of disagreement with Perth based management, saying Ihug had recapitalised ahead of schedule and the merger had left iiNet with the remnants of a head office it no longer needed in Auckland. He'd been brought in to sort out and restructure Ihug. He had also become increasingly vocal about industry issues such as the proposed opening up of Telecom's networks to competitors. While he was keen to stay in the telecommunications industry he would never reconsider joining Telecom. "Hell will freeze over first. I don't think I'm flavour of the month at Telecom." He left iiNet as it announced an A$1.5 million profit for the second half of 2003.[21]

Although the market had come under significant pressure, with fallout recorded after the free ISPs entered the market to take advantage of cross-carrier interconnection payouts, things appeared to have settled. The big players had taken over or acquired most of the gratis subscribers who realised the free lunch was over. The profit for smaller players was gone, leaving only those with a stronger business focus and diversity of services to pick up the pieces. In 2003, just when it looked as though the ISP market had bottomed out in terms of attractive dial-up rates, another price war broke out.

The move in February by paradise.net to undercut rivals with a revised monthly dial-up plan; 20 hours for $10, 150 hours for $15, and 250 hours for $20, gave the budget market a real shake-up. The deal was topped off with free Web hosting and multiple email accounts. Knowing there was little margin in dial-up access, many saw this as a strategic move to draw residential and low-end business users into the TelstraClear stable. Its ClearNet offerings remained focused on higher-end, more profitable business services. It may also have been a ploy to keep the remaining i4free customers from defecting elsewhere for a better quality of service.[22]

ACQUISITION TRAIL CONTINUES

Among those on the acquisition trail was Orcon Internet, which rated in the top ten of second-tier players and already had an impressive record buying up smaller players including ProHost, Clubnet, Bestnet, Securenet, NZOn-line, AGlobal, Dreramnet, and Wisenet. Among its acquisitions was the iPhone business previously operated by Voyager and MCI Worldcom.

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In 1994, while participating in the Fletcher Challenge Young Enterprise Programme at school, Seeby Woodhouse began to harbour ambitious dreams of building a large New Zealand technology company. He drew a visual icon called The Orconagon, which eventually became the company logo, ultimately shortened to Orcon. While at university Woodhouse started Orcon Group, providing computer advice and support, and selling early model cellphones and accessories. The business expanded to include PC upgrade and repair services largely focused on Auckland's North Shore.

By 1996 it broadened to become a nationwide distributor, and in 1997 Woodhouse launched an ISP with three dial-in 33.6kbit/sec modems at the no-frills end of the market, around half the price of the cheapest competition. It aimed its services at more skilled and technically minded customers, and soon moved into wholesaling Internet capacity for other ISPs. This proved so successful he dropped the hardware services business and put all his energy into the ISP sector.

Orcon Group began developing its own billing system to handle not only its own growing requirements but those of its wholesale ISP customers. This resulted in the iBill system built in conjunction with Mark Mackay, director of Digital Edge. As a result of the obvious synergies, the two firms merged into what became Orcon Internet Limited. By 2002 Orcon was a major player in the residential ISP market. In fact by 1997 it had become New Zealand's fourth largest Internet provider, with a carrier-class Internet data centre and growth that took it to 80 staff and a 15-fold increase in revenues, according to the company.[23] From humble beginnings as a three-modem dial-up player in 1997, Orcon was by 2003 supplying Internet services to hundreds of corporate and business customers and thousands of residential customers, as well as delivering carrier services.[24]

Another success story of a backyard ISP that made it big is that of Maxnet, which by the end of 2003 had grown from a $35,000-a-year operation in a Warkworth bedroom to one of the five fastest growing companies in New Zealand. Its surprising success was also due to its acquisition of a handful of smaller ISPs, allowing it to provide a full range of access options including DSL, frame relay, and wireless. It had moved quickly into Web and e-commerce development, hosting, co-location, and voice and mobile. Maxnet was founded by 15-year-old Quentin Lake who had been running the start-up ISP from his bedroom after school. With the help of mentor Anthony Urbahn he built the business to a multimillion-dollar enterprise, which gained fifth place in the Deloittes Fast50 awards. In mid-January 2004 it was rated 21st fastest-growing business in the Asia-Pacific region finals.

According to Xtra marketing manager Chris Thompson, the biggest challenge in the growing Internet business was managing complexity. "What used to be a dial-up business is increasingly a mobile and a broadband business with a wide range of customers, from those just starting out to those who want sophisticated solutions." There's unlikely to be much of a change in the economics of Internet access with costs as low as $1 a day through some providers, although the differentiator is often what you get with your account, whether its virus protection, spam filtering, music, games, lively and current content, additional email addresses or Web hosting."

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Users were becoming more specific about what they wanted and adjusting their surfing habits accordingly. 'Power communicators' were more focused on using the Internet as a business tool, to send email and get information quickly, narrowing their resources to maybe six reliable sites rather than a lot of pointless surfing. Then there were the 'happy adventurers' who were less likely to have any purpose or direction, happily downloading MP3s and randomly following links, viewing the Internet as entertainment and an alternative to sitting down in front of the television.[25]

According to the Ministry of Social Development more than two-thirds of New Zealanders had Internet access at home by 2004, placing us 8th in the OECD. The number of people aged 18 and over with Internet access, had jumped from 36.5 percent in 2000 to 65.1 percent. Asian and other ethnic groups were at the top, their access rate rising from 50.5 percent to 79.6 percent by 2004. The least connected were superannuitants with little secondary income, but that was still well up on the 2001 figures.

Internet access had grown 36.8 percent to 63.1 percent between 2000 and 2004 for Europeans; 26.9 percent to 45.5 percent for Maori, and 11 percent to 39.5 percent for Pacific Islanders. Working age households aged 18–64 with at least one full-time worker increased their access from 42.6 percent to 73.5 percent.[26]

New Telecommunications Commissioner Douglas Webb took up his five-year appointment in March 2002, with the job of smoothing the way for more equitable competition. In his first determination he stated the cost of providing free connections to all homes must be shared by all carriers. Of course Telecom was delighted and had already pre-empted that decision by contacting CallPlus, Compass Communications, Global One, Ihug, TeamTalk, TelstraClear, Vodafone, and World+Change in December 2001, attempting to recoup 'losses' it had allegedly made, complying with its telecommunications service obligations (TSO) or Kiwi Share arrangement.

Douglas Webb, the first Telecommunications Commissioner.

However in the backhander, Telecom was ordered to more than halve the interconnection rate it had been charging other carriers for access to its network. In November 2002 Webb set the rate at 1.13c per minute, less than half the 2.6c Telecom had been charging, and ordered Telecom to pay TelstraClear $14 million to cover the difference between the two rates during the five months it first lodged its application.

Telecom was still bringing in about 75 percent of its revenues from the retail market but reported a net loss of NZ$188 million for the year ended 30 June 2002, after a partial write-down of its investment in Australia's AAPT. It also claimed $471,000 for difficult-to-maintain residential customers, including those in the rural community, which it said were costing it $400 each a year. Hundreds of jobs

were axed as it attempted to streamline its operation and recoup some of its losses. In the wake of the Clear Communications acquisition, TelstraSaturn divested itself of 650 staff. Sky TV meanwhile began to supply services in an exclusive agreement to TelstraClear's 26,000 pay TV subscribers, making it the only pay TV provider of any significant size.

DON'T DROP THE BUNDLE

Calls for Telecom to unbundle the copper and give everyone a chance to compete for the provision of higher-speed Internet connections into home and business had been growing since deregulation. In fact the realisation Telecom owned the copper into every home as well as the customer's telephone number had come as a shock to some. The dilemma was that any competitor had to go through Telecom and pay the fees it determined or be excluded from the market. It was far too costly for anyone to replicate the Telecom network, and with the arrival of DSL technology it was obvious Telecom could again control the game.

Unbundling had been dropped from the Telecommunications Bill before it went to parliament but there had been pressure to put it back on the agenda ever since. On a visit to New Zealand in October 2001, Allan Fischer-Madsen, chairman of the International Telecommunications Users Group (INTUG), insisted unbundling was essential if New Zealand didn't want to fall even further behind Europe and the United States. While governments across Europe were initially hesitant to unbundling, they had begun falling behind in getting high speed services out to everyone, and were now moving quickly to catch up. In fact the European Parliament had passed legislation to allow competing companies access to the last mile. "If you want to move and have competition in telecommunications you need to do something specific to create that competition," he said.[27]

In April 2003 Telecom set bold new targets claiming it would get broadband into 100,000 New Zealand households by the end of 2004. It would radically reshape its services and introduce a new range of competitively priced broadband packages; catering for those who only wanted New Zealand content, through to heavy downloaders and gamers. The announcement was part of its 'convergence' strategy, which it claimed would let customers access any telecommunications service, anywhere, at any time. Was this a battle strategy to catch up with market demands, and plan for the inevitable future of pervasive broadband, or just another distraction?

"The 100,000 target – almost three times the approximately 36,000 households who are currently broadband connected – is more than just a number. It represents the sort of critical mass needed to make convergence a reality," said Telecom chief operating officer Simon Moutter. "It is quite simple, really – until a critical mass of New Zealanders use broadband on a daily basis, and experience firsthand how it can enhance their lives, convergence will just be a lot of hot air ... From now on our focus will be on providing content and services tailored for the broadband environment in an integrated way, enriching customers' experience on Telecom's next generation Internet protocol network."[28]

However, such ambitious targets would not make the slightest dent in the problems New Zealand faced, unless the real barriers were removed, said TUANZ chief executive Ernie Newman. He believed broadband would continue to languish until price, competition, and the effects of the Kiwi Share were addressed. "That New Zealand is 25th in the OECD for broadband uptake and sinking fast is an economic disaster that must be addressed ... As a small and isolated trading nation, we have to be the first to pick up technologies that remove the disadvantages of distance, not the last."

Although the cost of JetStream was only slightly more than Sky Digital ($55.54 a month) and cheaper than a daily coffee, Newman contended the first barrier to a massive consumer shift to broadband was still price. At $69 a month with a usage cap, he said Telecom was being 'too greedy'

and it must drop the price and remove the cap, to get more users on board, positioning JetStream as a mass-market product, not a niche one.

At Telecom HQ in Wellington, rural solutions manager Seager Mason sounded a little war weary when discussing the pricing of JetStream. One reason people weren't signing up for the service was they didn't know it had arrived in their region yet, although he admitted high price was a factor. So why was that an issue, when in 2003 dial-up Internet access prices here were rated as the cheapest in the world? Xtra was charging NZ$27.95 for unlimited dial-up when Australian ISP Telstra Big Pond was charging about NZ$45 and in the US, access to giant ISP America On-line cost approximately NZ$42. Well, Mason said, the free ISP services of a couple of years ago were a clever manipulation of the interconnection deal between Telecom and Clear, and while unsustainable they had driven access pricing down.

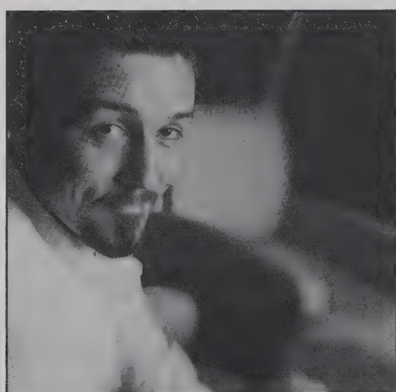
Even where JetStream was available, only about 5 percent of subscribers were signing up. The rest were reluctant to make the jump from inexpensive unlimited dial-up access to around $65 per month for JetStream. So what did this mean for nationwide high-speed Internet access? Simply that Telecom needed to see that an area was financially viable before it would install the service. Mason said the numbers required to make the business case weren't huge. Three or four businesses, or 27 home users signing up, was enough for Telecom to put JetStream into an area. "We had a situation recently where a guy wanted JetStream at his bach … We told him what the story was, so he went door knocking and got enough people in his area to commit to it, for us to put the service in."[29]

WHOSE CAKE IS IT?

The entry-level carrier market, which now included more than a handful of ISPs looking for the main chance, was continually redefining itself, specifically with the rapid roll-out of full IP-based networks which allowed delivery of carrier-grade voice services alongside Internet and data. Margins in the voice and ISP market had been savaged in recent years and while many ISPs and second tier carriers were reselling Telecom's DSL, this was only because there were few if any alternatives.

Telecommunications Commissioner Douglas Webb was under increasing pressure to promote a greater level of competition through fairer interconnection fees, wholesaling, and local loop unbundling. The smaller carriers were hoping he would give the market a shake-up, and offer them a fairer share of the $6 billion cake. The cake was still largely owned by Telecom, TelstraClear, and Vodafone, and those in the next tier of carriers were covetous for anything left that had icing on it. Early in 2003 there were only around 19 players remaining in this middle ground, who aspired to become full-service telecommunications providers or operate as wholesalers, reselling bandwidth, tolls, or Internet services.

Despite attempts at cracking the local market, second tier carriers had made little impression. Telecom's share of the contestable fixed voice market had only slipped from an estimated 85.4 percent in 1997 to 78.8 percent by 2002 with a further 1.2 percent drop expected in 2003. It was a similar story in the data market, where the high price of leased lines and the



Telecom's Xtra marketing manager Chris Thompson.

cost of terminating circuits or tails was a source of regular complaints from businesses, needing to move growing volumes of data about the country.

Murray Young, telecommunications specialist with TeleConsultants, believed second tier carriers were in for a hard time as they sought interconnection deals similar to that struck between Telecom and TelstraClear. In the early days of deregulation there had been plenty of second tier players offering discounted tolls; the survivors had built a robust business in particular market segments, become ISPs or partnered with others. "Some may be driven out of the market; others will change form and need to work hard to maintain their position. Those with their own bandwidth may be more viable."

The lack of competition had spawned a number of community-based networks where universities and research institutions teamed up with industry to create their own city-wide or campus-wide connectivity. Some wireless players were finding a growing interest in their offerings to get around the local loop. United Networks and Counties Power entered the market, alongside independent companies such as Wellington-based CityLink which was pouring cash into CBD fibre. It had more than 50km of fibre-optic cable above and below the streets of Wellington's CBD with more than 500 connections to 250 buildings. It also had a 'modest' network in central Auckland.

"No longer is bandwidth doled out in expensive multiples of 28kbit/sec in Wellington; it is liberally supplied at ten, 100 or even 1000Mbit/sec at cost-effective rates. Companies don't have to tolerate point-to-point circuits with expensive tails at each end, and a cost for each new link, they simply take a connection to PublicLAN and VPN to any other CityLink customers," said CityLink managing director Neil De Wit. The biggest challenge was sourcing sufficient investment to grow the network and expand the types of connectivity available, including voice services and its CafeNet wireless broadband business.

POWER TO THE PEOPLE

Power company United Networks had merged with telecommunications subsidiary Tangent, and both were acquired by another power and gas company, Vector, in 2002. Vector was looking at ways to merge the underground fibre-optic networks. It had more than 600,000 customers connected to its electricity network in Auckland and Wellington; its combined telecommunications assets included 950 square kilometres of fibre in the Auckland CBD and running parallel to the Vector line network out to Manukau and Papakura. The focus was mainly in the B2B market but it was also supplying wholesale bandwidth to ISPs and carriers.

Wired Country, a division of community-owned electricity network Counties Power, was not only providing wholesale bandwidth to parts of the Franklin and Papakura districts for voice and data; it was also moving into high-speed wireless coverage. Chief executive Neil Simmonds was keen to see what each community did once it got hold of the service. "We don't want to eat other people's lunch. We want our customers to be able to access services from any telco or ISP across our network." One major obstacle to growth was the lack of practical number portability – in other words the ability to take on customers from other networks and have them retain their original numbers.

Management changes at Auckland-based Walker Wireless had brought a tightened focus on extending its unlicensed national fixed wireless network, and gearing up for a major roll-out of a more flexible and affordable technology. The company was given a $20 million cash injection in 2002, $6 million of which was invested in a year-long trial of the new-generation wide-band CDMA network technology. Customers were "hanging out for alternative broadband options," said the company.

Another challenger in the wireless market was Compass Communications, which had invested millions to build its national and international network. It had its own ISP, tolls offerings and, through its

acquisition of wireless provider Radionet, a national presence from Whangarei to Queenstown. CallPlus was earning $30 million as a tolls provider but claimed it could earn triple that if Telecom allowed it access to its network. It was still trying to sue Telecom for anti-competitive behaviour dating back three years.[30]

While over 83 percent of the country now had access to DSL, there were questions about whether it was being marketed sufficiently well and priced enticingly enough to convince the majority of dial-up users to migrate. An always-on Internet connection and phone on the same copper cable was an attractive proposition, especially when you could share that bandwidth within a home or business through Ethernet cards in other computers or via a wireless network set-up. Speeds of 2–8Mbit/sec were available from the full-speed DSL service or 128–256kbit/sec at the low end, with access plans now ranging from $40–$80 per month. Complaints about the wholesale price of Telecom's JetStream continued, but most rival carriers and ISPs were reselling it under their own brands, often at a loss because of the low margin.

In August 2003 Telecom was accused of overstating its JetStream numbers and attempting to redefine 'broadband' to suit its purposes. There were reports only 13,000 residential customers had signed up for JetStream since its launch in 1999. Spokesperson Kerry Lamont insisted it had 44,000, but would not confirm how many of those were using the low-end starter package which ran at 128kbit/sec and was not considered broadband.

SO WHAT'S ALL THE FUSS?

Telecom's Xtra marketing manager Chris Thompson said all the talk about different levels of service were simply "nuances and words": it was all DSL broadband. Ernie Newman of TUANZ said if in fact a high proportion of users were on 128kbit/sec, it was an "appalling revelation" and meant New Zealand had probably been over-reporting its broadband use, and we could be even worse off than the current 21st placing out of 28 countries in the OECD broadband ratings. Telecom had promised 100,000 broadband connections and that should mean 256kbit/sec and upwardss, he said. "The debates that fudge the definition of broadband and try to tell us we're doing okay by world standards when we are patently not give us a sense of complacency."[31]

Ironically Telecom was still suggesting there was no real demand for higher speed services, and most customers were happy with their dial-up connections, claiming even those who migrate to DSL mainly used it for Web browsing and email. Thompson quipped, "Many customers haven't found anything they can't do with dial-up." He said prices would come down but this was gated by the worldwide cost of equipment and 'down the line' technology costs for cards and DSL modems, which were only coming down about 5 percent a year. "It's not the order of magnitude people were hoping for. We don't see any radical changes in our line cost structure."

Thompson said heavy downloads and accessing rich content was not a big driver, and most New Zealanders still needed educating about the benefits of DSL. "While people who have tried it would never go back, most are still not sure why they need it, and why they should pay more. As it is, almost half of JetStream Starter customers use less than 500Mb a month and more than three quarters use less than 2Gb a month."

There was uncertainty over what would actually drive people from their 56k modems to DSL. Would it be downloading CD-quality music, games, voice over IP, accessing educational, medical and government information, or telecommuting? Some analysts had predicted up to 500 million people worldwide would be using the technology to receive video-on-demand, videoconferencing and other multimedia, and e-commerce applications by the end of 2004.

Worldwide the DSL market was expanding rapidly. At the end of 2002 DSL lines grew by 15.3 percent from 35.9 million to 41.4 million by the first quarter of 2003. And according to

UK-based DSL research firm Point Topic, actual installations grew by 90 percent in the year to March 2003. Asia-Pacific was by far the biggest growth region. By the end of June 2003, Telecom's broadband penetration was 62 percent in medium enterprises and 12 percent in small enterprises. Its business and domestic DSL subscribers jumped 10,000 between March and June 2003 to 72,000.[32]

The Commerce Commission won approval for its recommendation to open up Telecom's copper line network in September, and while there was a sigh of relief across the industry, by the next breath the old 'we'll believe it when we see it' cynicism had set in. Competitors were betting it would be at least 2005 before unbundling had any tangible benefits, or even before they felt confident investing in equipment they could install at Telecom's exchanges to create their own DSL networks.

The commission was overtly stating that unbundling could result in $204 million in benefits over a five-year period as consumers took advantage of lower prices for fast Internet products. The draft decision was seen as a starting point to get New Zealand's abysmal broadband uptake beyond the 2 percent mark where it languished. "Eighteen months ago the United Kingdom had 3 percent broadband penetration, now it has 23 percent. The only reason is that Tony Blair got angry and shamed British Telecom in to changing," said analyst Paul Budde.[33]

Budde claimed New Zealand was missing out on a $2 billion growth opportunity through its failure to fully embrace broadband. An ITU study, which saw New Zealand drop from 12th to 21st among 178 economies in access to ICT, was clear evidence existing strategies weren't working. The ITU's digital access index measured affordability and education, as well as the traditional focus on telecommunication infrastructure, such as mobile phones and fixed telephone lines. "The government's heart is in the right place but it does not have the strategies to move forward." IT Minister David Cunliffe blamed the Asian tiger economies for pushing the country back in the ratings, saying there was no cause for panic.

"New Zealand business people seem to stick to old models rather than look to new opportunities. That is reflected in the fact 60 percent of managers in the United States and Europe have broadband at home, compared with only 10 percent in New Zealand," said Budde. Another factor was that Telecom was not showing leadership in making sure people took up broadband. While the rest of the world had moved on, New Zealand was stuck. The infrastructure build out was far too slow, through lack of competition, and it could take years for the telecommunications commissioner to create a competitive environment. "I don't think we have that time – if you want to close the gap you must run faster, or the gap will get bigger." Only affordable, high speed, unlimited access would attract broadband customers, and while Telecom's JetStream might be affordable, the service was substandard, and a fraction of what people got in other parts of the world, Budde said.

DSL RESALE INADEQUATE

Most of the $30 million or so the government intended to spend on Project Probe to get broadband to the regions would be wasted – either because it would go to Telecom or because it would be uneconomical. Rather than supporting companies such as Telecom, the government needed to promote grassroots efforts to bring broadband to communities. An action plan should be national, rather than just regional or provincial, because metropolitan areas also had broadband access problems.

Budde said countries that adopted broadband early were starting to reap the benefits. "You see this incredible spin-off once you get this digital economy going – businesses create new revenue from extra services on broadband, and health care and education are more efficient." In New Zealand, that could lead to an increase of 2–3 percent in GDP, worth around $2 billion a year, he said.[34]

By November Telecom was claiming 50,000 residential connections but allegations remained that possibly only 13,000 of those users were subscribing to 2Mbit/sec plus connections. This further inflamed those who didn't agree with Telecom's definition of broadband. The critics insisted 128–256kbit/sec customers didn't qualify. According to many international experts, broadband was any reliable connection able to deliver real-time video, defined as 2Mbit/sec and beyond. Anything below that benchmark might be considered narrowband.[35]

As the industry awaited a decision on LLU, based on the recommendations of Telecommunications Commissioner Douglas Webb and public submissions, a radical repositioning was occurring among Telecom's competitors. TelstraClear, already providing a cable modem service in Wellington and Christchurch and reselling Telecom's DSL as On-Net from 2003, had launched its own DSL service. It still believed the lack of broadband was costing New Zealand about $4 billion a year or around 3 percent of GDP. If it had local loop access it could provide its own DSL variant at sharper prices.

"We could connect our state-of-the-art IPNetwork and deliver high-quality broadband to small and medium businesses, home offices and households with a choice of brand, price, service and billing options. Telecom will benefit because they will be paid for the additional traffic running over their network," said TelstraClear's corporate communications manager Ralph Little. Telecom was obliged to provide a 16 percent discount on DSL resale but TelstraClear insisted this was still conservative by world standards.

Meanwhile Ericsson's new mini digital subscriber line access multiplexers (DSLAMs) were being fitted in Telecom cabinets across the country for a 'business only' service, with a residential offering planned. Also gearing up, where DSL was unavailable or unaffordable, was Woosh, in conjunction with Vodafone and BCL. The consortium finally began delivering fast Internet, voice over IP and switched voice through the eXtend network from November 2003.[36]

Then two days before Christmas 2003 the Commerce Commission did an about-face on the proposal it had approved earlier in the year. It rejected LLU in favour of a dumbed-down approach. Instead of opening up Telecom's network for competitors to install their own equipment and establish independent network access, the Commission elected for a 'wholesaling option.' It told Communications Minister Paul Swain it did not "recommend the specification or designation of unbundling of local loops." It wasn't satisfied the overall benefits of LLU justified its introduction and favoured Telecom wholesaling high-speed data services to its competitors.

Telecom would essentially rent the loop to its competitors at speeds and pricing to be determined by the commission. "The experience of a range of other countries with regulated local loop unbundling does not lend weight to the case for New Zealand to follow suit." It wanted Telecom to provide competitors with what it termed a 'bitstream' service which they could then on-sell. The announcement raised eyebrows, not only locally but around the world.

Late in the process, Telecom had indicated it was willing to introduce a form of bitstream service, which would allow competitors to extend their network reach and better serve the corporate sector and other large users. "Because of the presence of that offer from Telecom we decided it was important to give every reasonable opportunity for a market solution to emerge in preference to a regulatory solution." If Telecom's offer did not provide a satisfactory solution, the commission would further reconsider unbundling within six months.[37]

The challenge to Telecom's control of the 'last mile,' between the exchange and homes and businesses, was never going to be taken lightly. It had owned and controlled the DSL market for five years and was unhappy about the prospect of the proposed sharing arrangement, claiming it removed any incentive for continued investment in its infrastructure, its broadband products or to lower prices. Its targeted lobbying of government, and threats to stop investing in the local infrastructure,

were clearly a factor in the government's failure to follow through on unbundling promises. This only addes to the widespread criticism of New Zealand's failure to rise to the broadband challenge.

STILL BOTTOM FEEDERS

Our slackening performance in the broadband stakes showed up again when the 2003 figures were published, with growth less than half the average rate achieved by other similar OECD countries. The Point Topic Broadband Growth Index for 2003 rated New Zealand in the bottom five, just ahead of the Czech Republic and Latvia. Our 22 percent growth was one of the lowest of 35 countries, with only 1.74 out of every 100 Kiwis connected at broadband speeds. The June 2004 OECD figures further underlined our abysmal broadband uptake, positioning us in the bottom ten of developed nations, alongside Hungary and ahead of only Ireland, Poland, the Czech and Slovak republics, Mexico, Turkey, and Greece. New Zealand had about three broadband connections per 100 inhabitants. The OECD average was 7.5 per 100 households.[38]

A further indication of just how far behind we were came in August 2004, when the United States announced it had reached 51 percent broadband penetration and Australia had rocketed up to 34 percent. Mark Ottaway, managing director of Nielsen NetRatings, conceded New Zealand had done well to move up from 4.7 percent in 2003 to 10.9 percent of all Internet-connected homes, but still had a long way to go. According to the MED, 75 percent of us were regular Internet users. The majority, however, had 56kbit/sec dial-up or less, and most higher speed users were still on 128kbit/sec DSL.[39]

New Zealand needed a cohesive vision not only to guide it towards a converged future but to ensure it got there, advised TelstraClear chief executive Rosemary Howard. She told attendees at the Telecommunications Summit in June 2004 that a hard line was necessary because so many balls were in one court. "I would ask Telecom to stop using all the things they won't let the rest of us use, so they can see what it feels like. Maybe we'd then be able co-operate better, but until that happens we need a government and regulator with testicular fortitude. Information and communications technology were key enablers to drive up incomes, as we moved away from an agricultural- and tourism-based economy, but we were dragging the chain. You have to add value when you are one of the most distant countries in the world and we're not on that road yet."

New Zealand businesses across the board had one of the lowest levels of efficiency and productivity in the developed world. "Businesses spend about 3 percent of their gross domestic product (GDP) on telecommunications and that's about three times too small if we're going to be a knowledge economy." New Zealand had one of the worst broadband uptakes in the world, and only 7 percent of voice minutes on mobiles because it was so expensive to use, an issue the Commerce Commission was now investigating. Howard said the country was seriously lagging in a number of areas including number portability and anti-spam legislation, and without a forward-looking telecommunications policy, remained in an incremental catch-up position. While the European Union had all the layers of a visionary strategy, including broadcasting, New Zealand lacked a forward-looking, proactive, convergent policy.[40]

Meanwhile Telecom was looking at new and emerging technologies and working out how best to get them into the market. On average its investment in the overall access network had been around $110 million a year, although in 2002–2003 it invested $131 million in growth, rural upgrades, and renewal. It dropped prices for its existing Home JetStream plans by $10 a month, and introduced a new 256kbit/sec offering for $50 a month with a 500Mb data cap and 1Gb and 2Gb variations. Modem rental, exclusively from Telecom, cost $30 a month ($360 a year) but the market was now opening up and users could purchase their own modems for around $200–$300, depending on

how many computers you wanted to hook up, or if you wanted wireless access.

Telecom also shifted the goalposts by revising its promise to achieve 100,000 broadband customers by the end of 2004, confirming a new target of 250,000 by the end of 2005. This time around there would be no confusion about what constituted broadband, with Telecom CEO Theresa Gattung publicly admitting this was now viewed as 256kbit/sec and above, not the lower-speed services it had included in the in the past. She said Telecom had a million customers on dial-up and 100,000 on broadband "of one sort or another." The immediate challenge, she said, was to convert the million on dial-up to broadband. The gap between broadband and dial-up was now as little as $10 per month and 'close to the tipping point where customers see value in making the move.'

Theresa Gattung stepped into the Telecom CEO shoes in 1999.

Motivation for the more proactive stance being taken by Telecom may have come in part from the grand targets set by the government's Digital Strategy, which the industry had been making submissions on. It specified the ability to deliver high-end services including video-on-demand, in the foreseeable future. The positioning statement set vague benchmarks for carriers to deliver 'pervasive high speed broadband to support voice over IP and video.'

The goal was to have 85 percent of residential and SME customers in towns and provincial centres with Internet access speeds of up to 10Mbit/sec and beyond – possibly even 50–100Mbit/sec by 2010, using either copper or wireless technologies. We were told the industry "will need to replace all copper lines to exchanges and cabinets with fibre, and provide major users in cities with fibre connections on demand." That was the kind of access necessary for video-on-demand and other multimedia and entertainment businesses to become successful. At the time of that bold statement, even with Telecom's new account options, downloading half a dozen short movies or listening to Internet radio for any length of time would max out a 2Gb data cap, and speeds lower than 2Mbit/sec were frustrating gamers who wanted to use the new Xbox and PlayStation on-line services.[41]

INVESTMENT DIVERSION

Telecom, which had been reluctant to broaden DSL coverage in the past, now announced it would try to push this out to 92 percent coverage. Theresa Gattung claimed Telecom was committed to the next generation of DSL services, including VDSL, but wouldn't confirm whether this would be deployed beyond CDB exchanges. "We're looking at Europe and how video over DSL stacks up as a business case and what are people prepared to pay for. We are looking at a once-in-a-decade decision to move to a next generation network (NGN) including renewing our switches, investigating the economics of fibre to the home and delivery of the kinds of services envisaged in the Digital Strategy document."

Telecom was partnering with Alcatel and EDS to deliver a full IPNetwork. "Fibre to the cabinets is not the most important part of this change, we are currently engaged in a complete revamp of our PSTN switches, billing and customer support systems. We have a big investment programme over the next few years to completely reshape the interface between telcos and customers."[42]

And indeed it did. Details of the next phase were announced in July, in a ten-year, billion-dollar investment plan for its NGN. It was already well advanced in its work with Alcatel to roll out a 'totally new infrastructure' across the country, to exponentially increase bandwidth to customers and pilot and deliver new services. It had already provided fibre to 1100 roadside cabinets (fibre to the curb) and would extend fibre to 1000 more cabinets over the next five years, over which time it would invest $120 million to enable new services for business and residential customers, including video, very high speed Internet access and 'other' new services. Fibre to the curb (FTTC) would be extended to fibre to the premises (FTTP) once demand for speed, capacity and new services developed in the residential market.

Meantime a $10 million pilot would be undertaken in the Flatbush residential subdivision and the Highbrook commercial development in Manukau City. A further $110 million would be invested in enhancing data services over copper cable through to 2007, including enhancing its broadband equipment. And $25 million a year over five years would increase the capacity of the core fibre network to meet growing bandwidth demand and develop the next stage of its multi-service network, which would eventually carry all Telecom's voice, data, Internet, and video traffic.

New fibre routes would also be installed between Auckland, Hamilton, the Central North Island, and the lower South Island, and the capacity of its existing fibre expanded to cope with expected demands. Telecom had also begun replacing its telephone network including its ISDN service. A new Alcatel next generation exchange would be installed in Auckland to provide ISDN services in 2005, and detailed planning was underway to replace 600 exchanges and remote line concentrators with new IP technology over the next eight years.[43]

Meanwhile back at the coalface, where the market was still crying out for an improvement in basic DSL services, Telecom was making adjustments to its accounts and keeping its competitor just sufficiently behind the curve. Its DSL competitors purchased at wholesale rates but were initially constrained to lower speeds than Telecom itself. A more reasonable 'bitstream unbundling' option was supposed to be available to competing carriers by mid-2004 but kept slipping out. Progress was being monitored by the government, which wanted to see greater competition in the market by early 2005, otherwise it might take a harder line.

Telecom introduced new packages extending the data cap out to 10Gb on some accounts, but more tightly managing the throughput to specific parameters. That included plans to 'grandfather' the 'full-speed' 600Mb capped account, which had ranged from 2Mbit/sec to 8Mbit/sec speeds, effectively scaling back top speeds on all accounts to 1–2Mbit/sec. Entry-level accounts for 128kbit/sec–256kbit/sec now cost $40–$50 with 500kbit/sec–2Mbit/sec offerings costing up to $80 per month, depending on use. By the end of 2004 Telecom had about 120,000 JetStream customers, and claimed it would soon have 100,000 on a minimum of 256kbit/sec speeds.[44]

Internet Society executive director Peter Macaulay, however, believed Telecom was still clouding the issues around broadband. He said it was time to stop using the term broadband to describe 'neutered' 256kbit/sec technology and make it a minimum 2Mbit/sec to the subscriber and 500kbit/sec from the consumer to the network. "Telecom's got a three-year window with DSL but by the time they start delivering the real product to everyone it'll be obsolete like dial-up is today."

18

Download culture

Infotainment on demand

> The better technology gets in delivering, the better the technology will become for reporting … It'll all be kosher in the near future, Mike Chunn, New Zealand country manager for the Australasian Publishing Rights Association (APRA), on music downloads in 1998.[1]

> I think we are getting to the point that a strange relationship would be one where there was no virtual element. We are at the tipping point: how can you be friends with someone who is not on-line? In a couple of years, we will be no more disturbed by our relationship with virtual worlds than we are by our relationship with television, William Gibson, 2007.[2]

A combination of Internet access, faster computers, CD recorders, and technology that squeezed music files down to one-tenth of their normal-size posed a major challenge to the music industry at the end of the 1990s. By the new millennium, the download culture, along with the huge trend to social networking, had challenged not only the music, movie, and television industries, but transformed the entire mode of on-line interaction through its collective influence.

The chasm first began to open in mid-1997 when free MP3 compression software became available on line, enabling anyone with a computer to easily create, play, copy, and distribute music files. The software typically reduced a song from 60Mb to 5Mb of disk space, which meant up to 140 songs could be saved on a recordable CD, and slightly fewer on a Sony minidisk or flash-based memory card.

The resulting files could be sent from computer to computer by email, FTP or shared via IRC or ICQ forums. Users could also download 'jukeboxes' to help manage music files on hard disks and CDs or load songs onto minidisks or portable solid-state players.

The MP3 format had thrown the recording industry into a spin and rapidly became a runaway global phenomenon with legitimate and blatantly pirated songs criss-crossing the globe. The new piracy trend had taken off in the United States, particularly among college students. At universities, students were taking turns buying the latest CDs to convert to MP3 for distribution to ever-widening groups of friends.

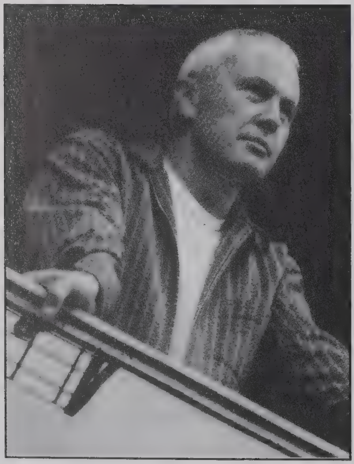
Many were no longer buying music but were using fast Internet to access and share illegal copies of the latest songs. While local Internet users, who were still struggling to get broadband speeds, had to wait 30 minutes or more for a track to download, the compressed music format was catching on in New Zealand universities, where fast Internet was available. The search item 'MP3' had become the third most popular on the AltaVista search engine[3] and there was even an MP3 top 40.

While unsigned indie or world music artists now finally had a chance to market themselves to the world, record companies had been caught off guard by the proliferation of songs from their catalogues being illegally copied. Even if they wanted to, there was no means for them to protect copyright, extract royalty payments for songwriters, or maintain control over traditional distribution channels. On-line piracy was spreading like a virus.

RECORD INDUSTRY IN A SPIN

Individuals and ISPs around the world were being threatened with legal action unless they removed 'illegal' music files from their web sites and hard drives. The recording industry even hired electronics and computer experts to track down thousands of sites containing hundreds of thousands of offending audio clips, which were seen as a threat to the industry, undermining sales, copyright, and royalty payment structures. It was exploring every option to trip up the impudent MP3 industry until it found a way control the technology and establish legitimate sites.

Mike Chunn, New Zealand country manager for APRA, wasn't too concerned. He believed the industry would eventually work out an accurate system for detecting and reporting. "The better technology gets in delivering, the better the technology will become for reporting." Internationally all collection societies including APRA were looking to find "a technologically accurate way of knowing who's doing what with the music, and to report what's been downloaded," he said. He claimed the MP3 issue was about novelty value. "It'll all be kosher in the near future."[4]



Mike Chunn, former Split Enz and Citizen Band member and head of APRA in New Zealand. Photo: MIS Magazine.

Around five million MP3 software players had been downloaded from the Internet by 1998 and the format had become so popular that the first of a new generation of MP3 hard disk-based or solid-state, handheld players were being sold with storage of up to 64Mb. The music industry was again in reactive mode in October 1998. The Recording Industry Association of America (RIAA) and the Alliance of Artists and Recording Companies (AARC) obtained a short-term injunction against Diamond Multimedia to halt the launch of its Rio portable MP3 device.

In the United States the manufacturers, importers, and distributors of digital audio recording devices received immunity from copyright infringement if they paid a royalty to compensate composers, musicians, publishers, and record companies. They also had to incorporate into their products a serial copyright management system, (SCMS) to prevent second generation copies being made. Essentially the recording industry had been caught on the hop without the agreements or the technology in place to keep pace with the MP3 revolution. RIAA failed to prevent the release of

the Rio solid-state player, when it was technically classified as a computer peripheral, not a recording device.

During a summit at the University of California in San Diego in June 1999, John Perry Barlow, Electronic Frontier Foundation (EFF) co-founder and Grateful Dead lyricist, claimed record companies were trying to use the law to 'bottle up' music and other content, which he described as "the common property of humanity." In this case, the vessel for that content was the compact disc. Barlow predicted that as music downloading became more popular in the mass market, the need for physical product would wane, along with the power of the record companies. "We need a different economic model. The one we have now is based on the material containers" that hold the music. The record industry countered that it invests a great deal of money and resources to find, develop, record, and market artists. Studios said a lot of money that doesn't get paid directly to the artist is spent on building them up, getting them on the radio and MTV, and marketing products such as CDs and concert tickets.[5]

In New Zealand, Michael Gladding, managing director of Sony Music, warned that downloading MP3 files could destroy the basis of his business, the payment of royalties. "In an ideal world governments would ensure the technology would allow you to download but not pass it on. We're a hardware and a music company but the problem is where you have third parties who create hardware without giving a damn about intellectual property. We're trying hard to control the rights to our product and for five years we've always said no one can put our product on the Internet. If we don't control it the artists won't get paid," he said. Locally, copies of Stellar* and True Bliss songs were on the Internet well before their scheduled international release, and at least 150 MP3 sites with unauthorised Bic Runga songs had been found, according to Sony Music.

The issues facing the industry were compounded by CD recording hardware and software which was now mainstream, and supplied standard with most new machines. During Christmas 1999–2000 you couldn't get a CD recorder in New Zealand. Either there was a lot of pre-Y2K data back-up going on or the MP3 fad and home copying had caught on. In fact we were going through container loads of recordable CDs to feed our appetite.

The Recording Industry Association of New Zealand (RIANZ) admitted it felt powerless to do anything about the proliferation of illegally copied songs unless it caught a commercial operator in the act. "Even if there are 10,000 people in New Zealand downloading MP3 files illegally, what can we do until someone pops their head above the crowd? It's out of control," said chief executive Terence O'Neill-Joyce. RIANZ began its campaign against illegal MP3 songs in 1998 when it wrote to a number of ISPs and individuals asking them to remove unlicensed MP3 content. However the organisation had limited resources and its hands were full with more pressing issues such as lobbying for changes to the Copyright Act to protect intellectual property, and trying to catch unlicensed local operators who were using commercial grade CD burners to make and sell music compilations.[6]

NEW FORMAT FRONTIER

Not only indie artists but high-profile names were rushing to take advantage of the download phenomenon, from Billy Idol to Taylor Dayne and classics from Kansas, Dionne Warwick, the Blues Brothers, Willie Nelson, The Beach Boys, and John Hiatt. These were essentially promotional offers designed to sell albums, but also a small step by record companies to try to bridge the gap the new format had opened up.

While the major music industry players were decrying MP3 at one end of the scale, they were also hedging their bets with software players such as Microsoft's Windows Media Player embracing MP3, and the major electronics companies building their own MP3 hardware. By early 2000 more than a dozen players had appeared from electronics giants, including Sony, Creative Labs, Sanyo,

Samsung, and Casio. Locally the Warehouse chain sold out of its first parallel-imported Rio shipment. The tsunami of change was further complicated by the arrival of secure digital (SD) and Memory Stick solid-state removable media cards which would plug and play with notebook computers, next generation cameras, MP3 players, and even cellphones.

The first legitimate site to offer a portal for MP3 songs was US-based MP3.com. Following its overnight success similar sites jumped on the download bandwagon including Australian namesake MP3.com.au; even a group of New Zealand entrepreneurs got in on the game in March 2000 with MP3.net.nz. Those sites 'signed' artist contracts and offered a share of royalties based on the number of downloads, but the door for free, unprotected, illegal music downloads continued to open wider. As soon as authorities shut down one site another two would open elsewhere, and dedicated search engines soon helped locate them. The International Federation of the Phonographic Industry (IFPI) believed there were 100 million illegal MP3 tracks on the Internet at any one time, representing potential losses of up to a billion dollars in 1999. *Wired* magazine estimated about 17 million MP3 files were downloaded each day.

The next cause for concern among industry moguls was a peer-to-peer MP3 distribution network, devised by 19-year-old US college student Shawn Fanning. Napster was a freely available software suite allowing users to share MP3 music files by turning their PCs into servers to upload or download music files on request. Users would simply create a music folder on their PC, type the name of song they wanted and pretty soon the folder was filling up with responses. Napster could download three tracks at a time, and if you had a song someone else wanted, their machine polled yours and away it went. The software had its own music player and automatically catalogued the music received. To cap it off, the latest MP3.com service allowed users to register CDs they already owned so they could download them and listen to them from a PC or portable audio player. The RIAA was livid. It had tried to put a lid on the unprotected format and was now going to sue MP3.com, for infringement of the copyrights of record labels and artists.[7]

It was too easy to dismiss MP3 as a pirate's paradise. It should have been viewed as the ultimate beta test for the future of the music industry, and the ideal proving ground for up-and-coming talent. Way before the mainstream music industry fuss, the format had helped liberate many independent artists and made freely available a cornucopia of legitimate sounds from every genre. Increasingly sites were ensuring artists got paid, which in itself addressed one of the main concerns. North Shore band Mistake Theory, one of a dozen or so local bands with legitimate songs on MP3 sites, had more than 15,000 downloads at MP3.com and eventually made it to the top of the trip hop charts. The real rewards came from the high profile they achieved and the royalty cheque, which was greater than the band's earnings from APRA, the official royalties distribution agency in New Zealand.

Paul Jessop, UK-based director of technology with IFPI, was waging his own war. In New Zealand for a copyright conference, he said record companies must keep MP3 out of the mainstream and its users in 'the swamp of infringement' where they would miss out on new-generation enhanced products. Forrester Research, however, predicted the market for digitally downloaded music would grow to US$2.2 billion by 2003. Record companies wanted their share, but were still trying to get agreement to firm up their secure digital music initiative (SDMI), designed to protect digital downloads and help track pirates. Ultimately compliant players and product would be introduced to further screen out counterfeits. SDMI, they believed, would ultimately provide copyright and trademark protection on digital media, including DVD and CDs, as well as MP3 and other download formats. However there were concerns that no matter what the industry did it would be hacked. The Rio and every streaming media package had already been 'liberated' by people determined to free the music.[8]

PIRATES ON DIGITAL SEAS

Analyst Jupiter Media Matrix said word-of-mouth from a younger, mainly 17- to 24-year-old, male-dominated audience was driving the latest round of exponential growth for next generation file sharing services. The 'market' had grown a massive 492 percent, to 6.9 million files between March and August 2001. Music sales slumped 5 percent across all major markets, except France and the United Kingdom, during the first half of 2001. New Zealand was no exception – some music chains claimed sales had slipped about 2000 units per month. Illegal CD copying and on-line file swapping was blamed. In the United States the National Association of Recording Merchandisers (NARM) said record companies had contributed to the problem by failing to provide attractive retail alternatives to file sharing. It said retailers could have been competing with the trend but instead had increased CD prices and consumers were burning discs and sharing files on a massive scale.

Major record labels, quick to criticise attempts by rivals to provide on-line access to music, were exceedingly slow to come up with an alternative. In October 2001 the five major labels, representing 85 percent of the industry, were readying their own digital distribution channels and preparing to unplug illegitimate competitors. RIAA, representing more than 600 record companies, was going after music pirates with specialised computer hacking software which could delete illegal files or prevent downloads, using a type of DoS attack. The industry was also pushing law changes to embed copy-protection controls in nearly all PCs and consumer electronic devices, believing this would speed up the official distribution of movie and film content over fast Internet.

While industry paranoia highlighted an uncomfortable trend towards dishonesty, contributing factors were often overlooked. MP3 rose to global prominence because major labels didn't support world music or reinvest profits to foster and encourage new artists beyond a tight radio-play prescription. They led by example with their technology and the pay-for-play process. Attempts to shut down entrepreneurial on-line sites, by refusing access to legitimate content or crippling CDs so they couldn't be copied for personal use, had resulted in a major consumer backlash. The cost of CDs was far too high for a piece of plastic worth little more than $1. Even when adding legitimate artist and distribution costs it still seemed excessive and parallel importing had made little difference to local pricing ($24–$34).[9]

After administering devastating blows to several pioneering on-line outlets, and with further court action in progress, the American Justice Department, the European Commission, and independent on-line players were asking if action by the industry wasn't in fact anti-competitive. Already the big boys had attacked MP3.com and Napster with all their legal might. In fact MP3.com and Napster had been forced into the hands of the big labels. Several copycat sites including Scour, Aimster, Morpheus, Kazaa, and Grokster had either been shut down or were facing court action for sharing music, movie, and software files.

Having opened a Pandora's box on digital downloads, MP3.com had a database of a million songs from unsigned bands, and was being restructured after being acquired by French media conglomerate Vivendi Universal. The site, which had 37 million registered users, fell foul of the major labels when it launched its My.mp3.com file-swapping service. Vivendi sued for copyright infringement, winning US$118 million before buying the company for its own on-line subscription service. The RIAA forced peer-to-peer file-swapping company Napster to pay US$26 million for unauthorised use of music and an advance of US$10 million against future royalties. Napster was sold to European recording giant Bertelsmann Music Group (BMG). A host of other independent music downloading and file sharing sites then sprang up in their wake.

Peer-to-peer networking was a 'disruptive technology,' so different to existing models it forced fundamental change, and opened up enormous opportunity for those nimble enough to follow through. At last the industry was reclaiming its territory from the remaining free file sharing networks

such as iMesh, Kazaa, and eDonkey. However an industry standard for downloads and devices remained bogged down in a confused mire of digital rights, copy protection, and playback technologies. The major investors were still insisting on trying to lock customers into their way of doing things. Research firm NPD Group said Apple with its iTunes commanded nearly 70 percent of the legal download market between December 2003 and July 2004. The new legitimate Napster took 11 percent, while major industry-run download portals MusicMatch, RealNetworks, and Wal-Mart took 6 percent each.

Despite the new legitimate face of the industry, research company Big Champagne said peer-to-peer file sharing was still on the rise. It claimed seven million people were on-line using such services at any time – half in the United States. That was a 20 percent increase over 2003. In New Zealand, demand for Apple's iPod was so great it took six months to clear back orders, and there were several thousand advance orders for the new iPod Mini, which went on sale in July. Many users were frustrated at the lack of a New Zealand outlet for iTunes and other major legitimate music download sites. Most US sites wouldn't accept New Zealand credit cards unless subscribers had a US street address. In its 2004 projections IDC called on-line music 'the first layer of the broadband content value stack,' pointing out the success of on-line music services such as iTunes, Musicmatch, Napster 2.0, SonyConnect in the United States and OD2 in Europe.[10]

KIWIS IN DOWNLOAD DELUGE

In 2005 pioneering local download site amplifier.co.nz had been delivering selected Kiwi music at $2 a pop. It was joined by Digirama and Coke Fridge (Coketunes) with their extensive catalogues of global and local songs. Speculation the number might be swelled by Apple's iTunes, which now operated in 20 countries, remained just that. Regardless, iPods had become an extremely popular device for people to upload music to. Worldwide more than 500 million songs had been downloaded from iTunes sites since it launched in April 2003. Kiwi iPod music fans were envious of their Australian cousins who could select from among a million songs (A$1.80 each) and around 1000 music videos ($3.60 each). Video clips could also be viewed on the newly launched video-capable iPod with the promise that TV shows and movies were on the way.

Locally owned Digirama had more than 100,000 songs and rival Coketunes had half a million plus. Users could preview songs and download in Windows Media Player (.wma) format. The music would play instantly on Media Player but needed to be converted to an MP3 format to play on Apple's iPod. Digirama let you burn or transfer to an MP3 player three times before security kicked in. Coketunes was in seven European countries and the software was imported for the local market by Coca-Cola New Zealand. It had a music fund, with a portion of every track sold going to quarterly grants to young local musicians. An early price war with Coketunes forced Digirama to cut its fees from $2 a song to $1.70.[11]

In the first week of December 2006 Apple Computer finally launched its iTunes store in New Zealand, giving the local market access to the same features, pricing and seamless integration with the iPod that had made iTunes the most popular music jukebox and on-line music store worldwide. With a catalogue of more than two million songs, the New Zealand iTunes Store now featured the largest catalogue of local and international music in the country. Songs were priced at just $1.80, music videos at $3.60, and most albums at $18. There were also 65,000-plus podcasts, from TVNZ, The Voice Booth, and Radio NZ.[12]

Coketunes started in late 2005 and instantly became the biggest legal download site in the country, but wound up on 10 August 2007. Coca-Cola said its demise had nothing to do with competition from other web sites and the heating-up of the digital music market since the Apple iTunes store opened. Coca-Cola communications manager Alison Sykora said the web site had


THE OFFICIAL NEW ZEALAND MUSIC CHART
The Official NZ Music Chart
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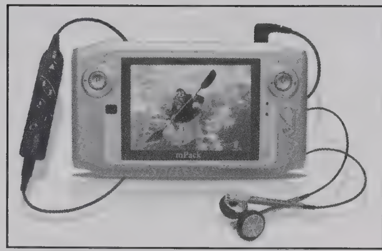
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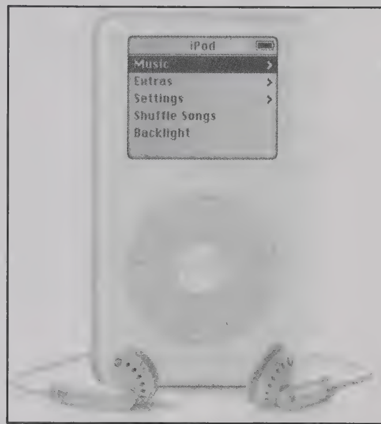
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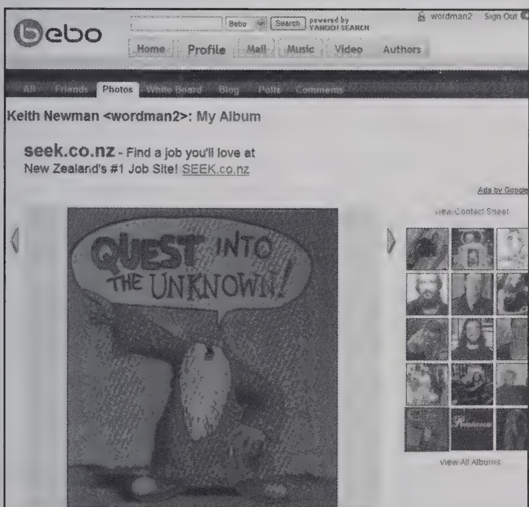
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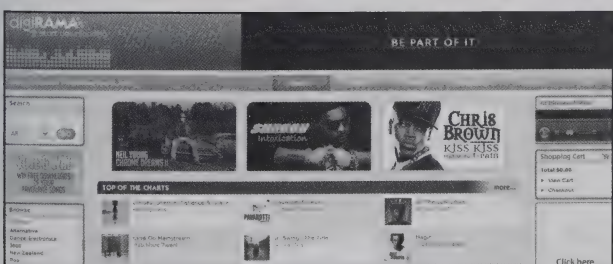
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served its purpose and it was time to focus on new ideas. "When we came up with the concept it was to provide something that wasn't available … It's basically a case of the job having been done." She said one of Coketunes' main objectives was to channel the profits from the web site back into a music fund to help promote emerging New Zealand artists. Only two received grants – singer Ladi6 got $15,000 for her debut album and Madison Press received $12,000 worth of music equipment.

The news of Coke quitting came just as the Recording Industry Association launched a new-look sales chart, based on counter sales, radio airplay and, for the first time, digital music downloads. RIANZ expected the singles charts in particular to take on a very different look once digital sales were taken into account.[13] *NZ Herald* journalist Peter Griffin asked in his blog, "Will this change the face of the charts? Probably the singles charts. But what will it mean for New Zealand music? Is a local song less likely to go to number one where digital single sales are accounted for? I doubt it will make much difference as the marketing efforts on the major download web sites are usually tightly integrated with those of retailers. If anything, it may allow some smaller bands to climb higher than they would have before."[14]

A new presence in the on-line music world entered the fray in July 2007 with some added value: a chat tool for fans to converse with their favourite artists, and the ability to buy tracks via text messages. Txttunes, two-thirds owned by former iPod distributor Renaissance Corporation, opened to New Zealand and US customers, and hoped to expand to the UK market as well. It offered independent labels and artists an opportunity to not only publish music and make money from sales, but also chat with fans and inform them of upcoming events and new releases. Txttunes CEO Matt Coleman said artists could upload their content directly onto the web site where fans could purchase tracks with a text message at $2 each. The company expected to have 1500 local artists by the end of 2007. The site launched with about 30,000 tracks. Txttunes was originally created by Brad Carter, lead singer and songwriter of New Zealand band Stereogram. The company was based in New Zealand, but had six business development agents in North America.[15]

ALL KIWI COPYING ILLEGAL

Access to digital music in New Zealand had been complicated by the fact that it was illegal to copy your old tapes or LPs into digital format, make music compilations, or even copy CD tracks onto portable MP3 players. Even taping TV programmes on VCRs and modern-day DVD recorders or hard disk machines was technically against the law. Legally you could have your CDs confiscated, face a hefty fine or jail time, but in this case the law really was out of step with the times, and no one was going to enforce it unless you were making multiple copies for sale.

In a way the old law made a mockery of tape recorders, CD and DVD burners, burning software, recordable media, and portable hard disk music players, so clearly designed to assist in this 'crime.' It was clear that CD writers had come of age by 2001. They were no longer optional add-ons but bundled with high-performing computers and so efficient as to make low-end back-up tape redundant. In fact the average computer could now easily perform as a real-time digital sound studio. In the late 1990s a four-speed CD writer cost more than $1000 and copying a 74-minute music disc took about half an hour. By 2002 writers operating at 52x speed cost around $300 and could record an album's worth of music in a few minutes; a little longer for rewritable disks. Blank CDs cost 50 cents to $3, depending on quality and quantity. The growing efficiency of the CD writer made life much easier for computer users needing to regularly back up or archive computer files or software, but there was no doubt that many were also using them for music.

While many drink coasters were created by earlier CD-Rs which left noise on the media, or were incompatible with some systems, the major hi-fi manufacturers had accepted home users were

creating their own compilations. They revised their players to bring MP3 audio encoding into the mainstream. The technology and the software that came bundled with the CD-R drive also improved, typically protecting against 'buffer under-runs' that used to cause recordings to fail or create errors in the finished product. In other words the process was now almost foolproof – even if you were to eject the CD in the middle of recording, chances were it would recall the exact position of the laser and resume where you left off.

Judging by the statistics New Zealand's love affair with home recording was escalating beyond all expectations. Between March and May 2002, 2.58 million recordable CDs were imported compared to 3.83 million pre-recorded music CDs. The monthly average of recordable CD imports for the previous two years had remained around a million but after 2003 continued to increase incrementally until memory card capacities grew to 1–2 Gb and recordable DVD technology (8Gb and beyond) began to move into that space.

Basically the music and movie industries had sat on their collective thumbs crying foul, while their electronics divisions sold a whole generation of CD and DVD burners, MP3 players, and burning software that enabled exact copies to be made of any song or movie ever produced. Music lovers have had the technology to do what they like with their LPs ever since the tape recorder, but digital media enabling format shifting to VCRs, Minidisks, CDs, DVDs, hard disks, memory cards, and now solid-state players had created a demand that the industry and copyright law were still trying to come to terms with.

MP3 players and portable media devices were by far the most popular consumer electronics items on the market, with New Zealanders spending $25 million on them in the first half of 2006. According to consumer electronics market researcher GfK, sales went through an astounding 864 percent growth in the six months to June 2006, compared with 2005. The new breed of miniature multimedia devices was vying for a niche between USB flash memory drives, phones that doubled as cameras and specialised players such as the iPod and a growing number of rivals. The latest fashionable, slimline devices weren't just providing copious storage for songs and photographs; they were also music players, FM radios, voice recorders, and video players.

Glorified storage devices that doubled as MP3 players littered the pages of sites such as TradeMe for around $50–$100, along with scores of older model iPods and other brand-name devices, whose owners were trading up. The fact that most pocket players were optimised for video was a massive sea change, causing concern among those whose livelihoods depended on DVD sales or rentals, now comprising half of Hollywood's revenues. They no doubt recalled the impact free-for-all audio downloads had on the music industry when the wildcard MP3 format got loose on the Internet, forcing the major record labels to rethink their strategies and come up with a digital one.

DIGITAL DOMINATES THE MIX

The music business maintained a healthy heartbeat; warnings of its demise amidstst the frenzy of anti-downloading and anti-burning publicity proving premature. The industry complained about the slowing sales of new CDs, but in fact it was still taking huge revenues from endless re-releases and back-catalogue compilations and making the bulk of its catalogue available for digital downloads.

Ranting over lost sales was moot; there was more music, from more artists available on more platforms and formats than ever before. According to the RIAA CD shipments were surging ahead in 2004, up 4 percent across all shipments over 2003 with 10 percent more CDs

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being shipped to meet that demand.

That news came after four years of steep decline, blamed on illegal downloading and piracy. Some thought the economic recession, competition from DVDs, video games and MP3 players, strong interest in world music by independent labels, and the suggestion mainstream labels had lost touch, may have been factors.

The real decline in physical sales kicked in from about 2006. The IFPI said total music sales dipped 4 percent to US$13.7 billion in the first half of 2006 while digital sales rose by 106 percent to US$945 million, now representing 11 percent of the worldwide recorded music market.

CD sales had fallen sharply to 553 million sold in the United States in 2006, a 22 percent drop from its 2001 peak of 712 million, according to Nielsen SoundScan and PricewaterhouseCoopers Australia partner Paul McNab, who warned digital music sales were slowly squeezing out old-fashioned physical formats such as CDs and DVDs. They accounted for about 81 percent of sales in 2006, but would drop to about 40.5 percent in 2011. His contention was that music suppliers stood to lose money as part of the inevitable shift from high-margin CDs to cheaper digital downloads.

However Richard Uechtritz, CEO of top Sydney music and technology retailer JB Hi-Fi, dismissed his concerns, alleging local music sales were as strong as ever and there was no indication shoppers would stop buying their music in hard copy. "Our sales [of traditional] music are going up by 30 percent a year and we are gaining market share."

Market research company Gfk said DVD sales had increased 15 percent by value over 2006–2007 and 25 percent by the number of units. Australian Recording Industry Association chief executive Stephen Peach also disagreed with McNab's findings, saying sales volume of traditional CDs had increased. "There's no indication that people are losing interest in the album format, and the album continues to be supported in CDs. It may well change over time, but it's still way too early to call the death of the CD. Lots of people are trying to forecast the future, but the drop of CDs predicted [years ago] doesn't seem to be happening yet. Digital has made real inroads into CD singles but it hasn't made much of a dent in the albums market."[16]

In New Zealand, however, by the end of 2007 legal digital downloads were dominating the pop charts and had sounded the death knell for the physical CD singles market. RIANZ added digital downloads into the mix with counter sales and radio airplay for the first time in May, more accurately reflecting what New Zealanders were listening to. For the first time songs or albums, downloaded from Amplifier, Digirama, iTunes, Telecom, or Vodafone to computers, mobile phones, or MP3 players were treated the same as a song or album purchased from a storefront music retailer.

Paul Kennedy, director of Media Sauce, which was contracted by RIANZ to compile the New Zealand charts, said digital sales included all the tracks on albums as well as designated 'singles' that record companies promoted, clearly putting music lovers back in charge of what ends up on the charts.

In the past a major record label might release a single into the stores ahead of an album release. In the digital age, once the album was out all tracks could potentially get onto the charts. One side effect is that diversity might suffer if a

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few artists like Justin Timberlake or Akon ended up hogging four places each. "It's still pretty much the same type of music and most of the songs on the charts are getting airplay but the big difference is the record companies have lost control over the timing of releases. Once they put an album out every song is effectively a single," said Kennedy.

Previously the charts were based on a 50-50 mix based on 3000–4000 physical CD sales and an analysis of what was being played on the radio each week. In late 2007 there were around 40,000 sales each week 90 percent of those digital. Chart positions are determined 75 percent on sales and 25 percent on airplay. It was decided early on that there wouldn't be a separate digital chart. In any case, said Kennedy, if there was it would be the top ten because digital dominates. And it's a fairly lucrative business, with 40,000 tracks downloaded a week at an average of $1.80 each – that's around $3.7 million a year. Meanwhile retailers stopped selling physical singles entirely.

While US CD sales were down nearly 20 percent in the first half of 2007 and in New Zealand there had clearly been a steady decline over the past four years, Kennedy said generally it was a good year for New Zealand music with physical sales plateauing. "It's not quite as bad as some would have you believe."

While illegal downloads and piracy continued unabated, recorded music was now competing with video games and other forms of entertainment for a share of consumers' disposable income. In fact many non-traditional outlets were spreading the sales of music through a much wider distribution channel than ever before.

On-line sales were booming worldwide, Starbucks was selling compilations that customers could make up while sipping their favourite brew. Walt Disney was offering a new CD format including digital magazines, song lyrics, band photos, and other extra features to try and reverse declining CD sales[17], and the record industry was still doing was doing very well, thank you.

SOLID-STATE PLAYBACK

Video distributors, mobile phone companies, Internet service providers, and broadcasters were gearing up to feed this hungry youth-driven fad, with everything from music clips to on-demand TV series for mobile players, known as 'mobisodes.'

Higher-end media players, with larger screens and video capability sold for $500–$1000 with up to 30Gb capacity, enough to deliver days of video viewing or game playing or sufficient songs to keep a radio station fresh for months.

Trusted brand names such as iRiver, Creative Labs, Toshiba, Philips, Sony, SanDisk, Samsung, Nokia, and dozens of clones, were trying to gain traction. Even Victorinox, the Swiss army knife maker, was in on the game with a knife was also a Gigabit MP3 player. Entry-level devices retailed from $100 to $200, with enough capacity for several hundred MP3 songs (1Gb–2Gb). Portable players typically came with a USB cable for easy uploading of song, videos, photos and other files direct from a PC, notebook, digital camera or other device.

Digital media players had been around for several years, but the iPod still dominated and iTunes accounted for nearly 70 percent of digital music sales in 2006. Eighteen more sophisticated, stylish, higher-capacity 20Gb–60Gb devices were expected to hit the market during 2008–2009 with a stronger focus on sound and image quality and compatibility with standard home entertainment systems.

DIGITAL COPYRIGHT CHALLENGES

The Copyright (New Technologies and Performers' Rights) Amendment Bill passed into law late in 2007, clarifying that music lovers could copy songs across formats once for personal use, and only if they kept the original. However there was an 'opt out' for copyright holders to prevent even that happening.

The long-overdue revision pseudo-legalising 'format shifting' of sound recordings passed through all the appropriate select committee proceedings in July 2007 but three months later was still waiting for its final reading in parliament. It eventually slipped through to be entered into the statute books.

The proposed changes to the Copyright Act 1994, intending to bring New Zealand into the digital age, had languished as a low-priority since first drafted in 2003. In July 2001 the MED released the discussion paper 'Digital Technology and the Copyright Act 1994' to canvas opinion on whether there was a need for revision of the law.

It was clear that technology had radically surpassed the capabilities of existing law, in particular the rampant penetration of PCs and the growth of the Internet which had enabled peer-to-peer file downloads of everything from electronic copies of books to music and movies. There were concerns about the role of ISPs and whether they had any responsibility for content passing through their systems.

The use of technological prevention measures (TPMs), which locked down content across a range of formats, including databases, was another concern. Would there be exceptions and who would be responsible for unlocking or bypassing these measures? Would such technology continue to lock down content even if future innovation forced further law changes?

After widespread discussion, new legislation was expected to pass into law in 2005; this stretched out to 2006 and finally it was all go in early 2007. During the waiting period, technology continued to shift and change. No one had heard of Google books where you could get the full text of thousands of books on-line, or social networking sites such as YouTube, Bebo, Flickr or Facebook when the bill was first drafted. A number of parties, including the recording industry and InternetNZ, made submissions on the bill in the lead-up to the Commerce Select Committee on 9 March 2007.

It was supposed to be designed to update the law to reflect changes in technology, while preserving the existing balance between users and owners of copyright works. In InternetNZ's analysis, the Bill failed to achieve these aims, shifting the goalposts towards copyright owners. It said ISPs should be treated as conduits and not parties in disputes over the use of content delivered over their networks. Improvements were suggested to permit certain levels of format shifting and time shifting of recorded material. The society argued against TPMs, proposing improvements.[19]

EDITING OUR CULTURE

A senior lecturer at Victoria University, Stephen Marshall, warned excessive digital copyright protection could let producers and mediators of digital content edit our culture. "Everything of significance to our culture in the next few decades will be digital and digital storage is no longer a strange new form

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of information, it's mainstream," he told an InternetNZ workshop.

The Bill restricted 'permitted uses' of copyright material for review or private study, allowing access only through approved channels, such as educational establishments and libraries authorised to possess equipment that bypassed TPMs, which were increasingly being built into digital works. Even libraries and other authorised custodians of history would struggle to keep up to date. And he said the capability of Tivo and similar personal video recorders to allow someone to build a library of episodes of their favourite TV shows could be stymied because their 'owners' wanted to make money by selling boxed DVD sets.

The intent of copyright legislation should be to prevent copying, said associate professor Suzy Frankel, but the effect of many TPMs would be to prevent access to the material. This inverts the original purpose of copyright, which was supposedly to assist education and creativity. She also objected to the wording of the Bill that required someone wanting to circumvent a TPM to go to an authorised intermediary.

InternetNZ wanted an improvement on the 'notice and take down' regime, whereby copyright owners could request that ISPs remove infringing content. Often the notice was unsuccessful because the person who posted the content could not be found. InternetNZ's preferred approach would be 'notice and notice.' When an owner notified the ISP, the ISP passed the notice on to the alleged offender if they could be found. If they had not replied justifying their action within 30 days, the material would be taken down. If they did reply, refusing to take down the material, the ISP would step out of the picture, leaving further discussion to the two main parties. A similar regime was already used in Canada.[20]

Further concerns about the Copyright Act changes were raised at an Auckland workshop, where some parties suggested the proposals could introduce onerous, harmful, or even unenforceable laws. The major concern was the consequences of statutes banning the bypassing of TPMs and defining what constituted permissible acts. Auckland University researcher Peter Gutmann and technologist Nathan Torkington said such clauses could perpetuate the term of copyright for digital content, as there was no way to implement an expiry date. This, Gutmann said, went against the intent of current copyright legislation.

Any attempts to circumvent the TPMs would require a qualified person, such as an academic, archivist, or librarian who must in turn seek permission from the copyright owner. Apart from extending and reinforcing existing copyrights, TPMs could also be dangerous; for example, entire medical systems might be rendered inaccessible, said Gutmann. "TPMs do not have the intelligence to work out if a user's action is illegal copying or legal backing up of content," Torkington said. Digital rights management prevented restoration and data recovery after the September 11 terrorist attacks in the United States, and the government there specifically banned the use of TPMs in its computer systems.[21]

Then there were concerns librarians could end up becoming unwilling copyright police. Auckland solicitor Rae Nield said the Bill required librarians and archivists to obtain and keep written requests from those seeking a copy of a digital work for private study. The request must state

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"the purpose for which the material will be used." The librarian concerned must make a declaration in writing, stating that the provisions of the Act have been complied with.

These declarations must be filed for three years and be available for inspection by the copyright owner of the original work. Not only would this create a huge amount of work for librarians, it could also result in a real invasion of privacy, she said. The provision potentially exposed the identity of everyone who had taken a copy at the library, and the reasons, to the author or publisher of a work. The applicant may wish to keep their motive for studying the material private, said Nield. Reasons for this could include matters of lawyer-client privilege – where legal cases were being researched – or confidentiality.[22]

FORMAT SHIFTING RULES

The Copyright (New Technologies and Performers' Rights) Amendment Bill passed through the select committee stages at the end of July 2007 in a form that the recording and movie industry bodies were pleased with, but which annoyed many who had sought to have digital era concerns taken into account. Under the new law ISPs could be held liable if they didn't take down content that was 'likely' to be a breach of copyright; music lovers could copy songs between formats once if they kept the original recording but record companies could opt out and instead prohibit any copying.

The previous law allowed video taping from TV but only if programmes were kept for "no longer than is necessary for viewing … at a more convenient time." That provision remained intact. Copying DVDs or videotapes to devices such as an iPod was prohibited. Technology commentator David Farrar said it was ridiculous the law change would apply to sound recordings but not video. "If you pay for a DVD why shouldn't you be able to copy it on to your video iPod so you can go to the gym and watch it?" And he said it was also stupid that while you could record a programme from TV, you could keep it only for as long as it would 'reasonably take' to watch it. Who was going to play copyright police and say, "This is three weeks old. You should have had time to view it now?"

RIANZ chief executive Campbell Smith said most companies already turned a blind eye to personal copying, and association members had never taken legal action to prevent people from taking copies for personal use. "I think it's fair. You buy something for your own use and that's how it should be." InternetNZ spokesman Jordan Carter said the proposed law was still more restrictive than US law, which had a long-standing principle of 'fair use' under which it was automatically assumed people could copy for their own use music they had bought.[23]

InternetNZ chief executive Keith Davidson said the public had been badly let down. "Format shifting of music is made legitimate for personal and home use but music suppliers can make it illegal by contracting out, presumably by simply putting a sticker on the shrink wrap at point of sale. What's the point of that?" As regards ISPs and their liability under the law, he suggested they would tend to be conservative and simply take material down regardless. This would create the 'chilling effect' noted in overseas experiences by affecting freedom of speech. While a penalty regime for malicious takedown notices had been included, this required a high threshold,

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and there was no benefit to the affected person or web site whose site might have been taken down.

Davidson said he couldn't support the new law. "It locks in outdated restrictions. The notice and takedown approach has been widely discredited internationally. Even major industry players are saying technological protection measures aren't relevant, and format and time shifting provisions are so restrictive that people will ignore them." The 'notice and take down' system, akin to that being abused in overseas jurisdictions had been retained rather than the 'notice and notice' system proposed by InternetNZ which it claimed would have avoided many of the contentious issues. "ISPs should simply not be put in the position of having to decide what is and isn't copyright infringement. Now they will have to pull material down if they are 'aware' that material is 'likely to infringe.'"[24]

Davidson said the process only served to highlight that copyright law in New Zealand needed to be completely rethought in the context of modern technology and the Internet. Trying to patch up the outdated 1994 Act had not worked.

SAVING OUR LIVES

Andy Warhol's famous 1960s quote "In the future everyone will be famous for 15 minutes" has an eerily prophetic tone about it now that we had the tools to capture, store, and display almost every detail of our existence. Some were taking the challenge to digitally document life seriously; hunter-gatherer instincts were in overdrive as technology unleashed extraordinary capabilities and capacity. With a minor investment anyone could record, edit or manipulate music, movies, photographs, or words and store, or publish the results in any number of public or private places.

Having a single portable device that could record, play back, or display all of your media requirements was high on the list of must-haves for the youth market in particular. The new tools seemed to appeal to a deep inner need to collect, archive, and share, and almost required a new vocabulary. In fact Trendwatching.com had defined the term 'life caching.' "Even though life caching seems very much about technology and virtual lifestyles, its behavioral drivers are nothing new. At the core is the need to collect experiences, which ideally convert into stories, [and] in return enable human beings to engage others; whether it's to please, to convince or to gain status. Oh, and let's not forget that in our individualised, 'everyone counts' society, all consumers have a story."

The Web had become a playground for anyone with the inclination to have an input into the 'collective unconscious.'

Home pages telling the world about hobbies, passions and interests were giving way to blogs, where anyone with an opinion could have a rant, adding their diaries and dialogues to the information overload.[25]

Social networking sites were the flavour of the year in 2007, and judging by the number of people drawn to them, keen to make their blogs, photo albums, home movies, and personal profiles public, it was fertile ground for the future. In fact the music and other industries were having to quickly wake up to another trend that had gone ballistic virtually overnight. Social networking was seriously influencing not only opinion, particularly among youth, but buying trends from fashion to music, and social attitudes.

The fact that major media companies were quickly acquiring any innovative on-line real estate to further exploit and explore options for the future was a sure sign the model was maturing. Google had acquired YouTube only two years after it had been created by two former PayPal employees; Fox Interactive Media's Yahoo! acquired del.icio.us and Flickr, and Rupert Murdoch's News Corp spent half a billion dollars on the company that owned MySpace.com. In New Zealand thousands of people were logging on daily to sites like MySpace, YouTube, Bebo, Facebook, LinkedIn, and Google's orkut.

New Zealand On Air announced it might fund productions made specifically for the Internet, and TVNZ launched its own channel on YouTube, regurgitating edited fragments from popular local shows alongside news and other content. Content included Kiwi musicians, film trailers, historic television footage – and dozens of videos of the haka and bungy jumpers plunging from bridges. New Zealand's best known YouTube contributor, Lonelygirl15, played by Tauranga-born actress Jessica Lee Rose, had already featured on the cover of *Time* magazine after reaching 7.7 million viewers on her channel; and Lonelygirl remained one of the most subscribed tags, even after the video log of her life was exposed as a made-for-the-Internet creation.[26]

In fact the YouTube confessional video-blog was being hailed as a new form of on-line entertainment with spin-offs appearing on other sites and new episodes of the Lonelygirl15 social network drama continuing to unfold. After her Bree character had been killed off, the Kiwi actress went on to mainstream success in film and television roles.

KIWIS IN MYSPACE

MySpace launched a New Zealand–focused site in February 2007, kicking off with about 300,000 Kiwi members and a live concert from Kiwi band Evermore, which used its presence to keep in touch with fans and develop a new audience.[27] It was heralded as an opportunity for local musicians and bands to market themselves. MySpace had more than 60 million users worldwide. It allowed users to share information about themselves and link to each other's pages within the site. It has been credited with launching the careers of a number of top bands including My Chemical Romance. Fox Interactive general manager Rebekah Horne said half a million Kiwis used MySpace, and that number was expected to rise in keeping with the Australian trend.

The site would initially be run from Australia but be tailored for a Kiwi market. Horne said New Zealand was leading the region in embracing new technologies. "Although the population is small, a lot of New Zealanders are really interested in popular culture – probably more so than Australians." New media commentator and journalist Russell Brown said the move into New Zealand was probably part of Murdoch's grander scheme to integrate his other media interests in film and television with the Internet.[28]

Telecom quit its long-term relationship with Microsoft in December 2006 and formed a new joint venture, Yahoo!Xtra, to become more aligned with the new social networking trend. Xtra had partnered with Microsoft in 2002 to provide content and on-line services for its default home page

and Web portal. The site had been consistently ranked at the top of Nielsen's monthly Web polls. Now Yahoo!7, a joint venture with Australia's Seven Network, had displaced the software giant with 51 percent of the new Xtra partnership. Telecom promised an enhanced range of news, sport, weather, and messaging services plus premium on-line services such as on-line photo sharing, local news, Internet radio, and enhanced spam and virus protection.[29]

Some of those promised services were a little while coming but were included in the August 2007 announcement for an exclusive VIP area for Telecom's 600,000 Internet customers, called Yahoo!Xtra Bubble. Despite launch problems, with some customers losing email access for up to a week, the site soon stabilised. Among the premium services was a personalised home page with customisable news, entertainment, and information from a choice of over 300,000 content sources, email storage, on-line photo storage and sharing with Flickr Pro, a 1Gb on-line briefcase and an all-in-one free security suite, featuring Norton AntiVirus. Clearly Xtra was seeking to differentiate its site and services and build loyalty.

VIDEO STREAMING

In May 2007 the statistics suggested about 75 percent of US Internet users were streaming video and the average user watched more than 2.5 hours of on-line content, according to measurement and analysis firm, Comscore. The Comscore Video Metrix report said sites run by Google topped the monthly rankings with the most unique video streamers and the most video streamed. Google sites grabbed 21 percent of all 1.8 billion videos streamed, with 1.7 billion originating from Google subsidiary YouTube.com. Fox Interactive Media ranked second, with 680 million streams, or 8 percent of the total, followed by Yahoo! sites, with 387 million streams, and Viacom Digital with 237 million streams. In all, Americans viewed more than 8.3 billion streaming videos on-line in May, said Comscore. The average video stream was 2.5 minutes, the average on-line video viewer consuming 653 video streams, or more than two a day.[30]

Social networking site Facebook, which launched in late 2006, was growing at an average of 150,000 people a day and by January 2007 had 30 million subscribers. By August it was trailing just behind MySpace, the most visited site on the Internet, with more than 100 million account holders. In New Zealand, Facebook ranked third, gaining about 1000 Kiwis a day, with Bebo the preferred site among teens.

Users could build their own home page with a customisable personal profile, which might include photographs, wallpaper, and links to information from any of 47,000 other networks that might appeal. They could add existing friends, invite new friends to join, and send messages to other users from within their page. More than 2000 accessories were available to 'pimp your profile' ranging from local weather forecasts, horoscopes, a graffiti pad, top friends list, games, and mood indicators.[31]

Social networking sites made up four of the 20 top web sites New Zealanders visited in August according to survey company Hitwise; Bebo was in fourth place, MySpace tenth, Facebook 12th and Friendster 20th. Facebook's share of web site visits increased by 240 percent between May and August 2007; and in July, possibly due to the school holidays, it overtook MySpace for the first time.

Networking web sites had a 270 percent increase in visitors worldwide during 2006–2007, according to Comscore. In comparative figures over a year to June 2007 MySpace remained the top social networking site with 114 million unique visitors, representing growth of 72 percent on the previous year. However Facebook was catching up, with 52 million unique visitors, up 270 percent. Facebook's growth may have been partly to do with media reports that Yahoo! and Microsoft had shown interest in acquiring it, but their multi-billion dollar offers had been rejected, said Comscore.

Bebo had 18 million unique visitors, up 172 percent and had a strong following in New Zealand. Comscore also surveyed Latin American Hi5, with 28 million unique visitors, and Orkut – owned by Google, although Friendster, which kicked off the social networking revolution, was now well out of favour with only 65 percent growth over the year, followed by Tagged, which claimed to have 30 million registered users and ten million unique visitors a month. In the Comscore study it had 13 million unique visitors in June, equating to annual growth of 774 percent.[32]

In October YouTube launched local channels in New Zealand. The pages featured localised search and home pages highlighted videos relevant to the local market. Comedy duo Flight of the Conchords, which had recently become overnight sensations in the United States with their off-the-wall TV series, and a teenager's ode to sheep love were among the most viewed clips at the launch. Celebrity bloggers were out in force and YouTube co-founder Steve Chen said the localised site would "showcase New Zealand's unique culture and lifestyle to the world."

Early content partners included TVNZ, 100% Pure New Zealand, and Sky News. "It's great to be able to bring the local users a New Zealand version of the site that will not only provide them with more relevant content, but will also help to reinforce connections and experiences within the local community." An added bonus, said Chen, was the chance for Kiwis to pursue the modern-day Holy Grail – fame.[33]

WEB TRANSFORMATION

Social networking sites fell into a burgeoning category known as second generation or Web 2.0 services, which were rapidly gaining ground because they were far more intuitive and delivered a richer, more dynamic and interactive experience. Web 2.0 was typically about the 'live Web' or web sites that had improved communication between separate software applications and people; for example blogging and social networking technologies that enhanced connectivity and collaboration between people. It was more about push than pull with content coming to the user rather than the user having to look for it.

At the heart of the move was a shift to open Web standards for describing and accessing data and improving interfaces to mimic the real-time responses of desktop applications. Web 2.0 was born in the aftermath of the 2001 dotcom-bubble bursting. "Many people concluded the Web was overhyped, when in fact bubbles and consequent shakeouts appear to be a common feature of all technological revolutions," said Tim O'Reilly, president and CEO of O'Reilly Media, who coined the term Web 2.0. "Shakeouts typically mark the point at which an ascendant technology is ready to take its place at centre stage. The pretenders are given the bum's rush. The real success stories show their strength, and there begins to be an understanding of what separates one from the other."

The concept of Web 2.0 began with a conference brainstorming session where it was observed that far from having crashed, the Web was more important than ever, with new sites and applications popping up with surprising regularity. The dotcom collapse seemed to mark some kind of turning point for the Web as the companies that survived appeared to have common qualities. The call to action to find out what that was became the Web 2.0 Conference. Within 18 months the concept had obviously gained ground with 9.5 million citations in Google (14 million in September 2007).[34]

A must-have for many frequently changing sites was rich site summary or really simple syndication (RSS), a family of Web feed formats used to publish frequently updated content such as blog entries, news headlines, or podcasts. An RSS document could contain a summary of content or the full text from an associated web site which could be read through an RSS reader or an aggregator, which summarised the content you subscribed to and would automatically update any

update when you clicked on it. Then there was the permalink, the first attempt to build bridges between Weblogs; literally a permanent link to a particular blog or article that remains active even if something had been archived.

The growing world of blogging gave rise to another term: the blogosphere, which embraced the bloggers' world of words or universe of discourse. "The blogosphere can be thought of as a new, peer-to-peer equivalent to Usenet and bulletin-boards, the conversational watering holes of the early Internet. Not only can people subscribe to each others' sites, and easily link to individual comments on a page, but also, via a mechanism known as trackbacks, they can see when anyone else links to their pages, and can respond, either with reciprocal links, or by adding comments," said O'Reilly.

Then there was collective, net-enabled intelligence which, through enabling people to leave feedback and comments, makes blogging an approach enhanced to great effect in services such as Wikipedia. Open source software projects like the thousands listed on SourceForge.net were often where new applications are launched, tested, and adopted by the wider Internet community. Anyone could add a project, or download and use the code, and 'new projects migrate from the edges to the centre as a result of users putting them to work, an organic software adoption process relying almost entirely on viral marketing.'

What was happening through the emergence of Web 2.0 applications, claimed O'Reilly, was a kind of collective intelligence operating as a kind of filter. What author James Surioweck[35] called "the wisdom of crowds" came into play, and produced better results than analysis of any individual document; the collective attention of the blogosphere selected for value. The world of Web 2.0 was also the world of what Dan Gillmor[36] calls "we, the media," a world in which "the former audience, not a few people in a back room, decides what's important." Riley said this whole area was in for major transformation as more and more devices became connected to the Web 2.0 platform. "What applications become possible when our phones and our cars are not consuming data but reporting it? Real-time traffic monitoring, flash mobs, and citizen journalism are only a few of the early warning signs of the capabilities of the new platform."[37]

Now with social networking sites going mainstream the companies behind their development were working on standards for third parties to create their own social sites or develop add-ons that might enhance them. MySpace and Google joined forces to create a set of application programmable interface (API). Plaxo unveiled new dynamic profiles that supported Google's new OpenSocial interfaces so users of Plaxo's Pulse social network could create professional and personal profiles including photos, contact information, and privacy settings.

Any applications written using the Google OpenSocial format could be embedded in the profiles. The idea was to allow developers to learn one set of APIs, based on Web standards such as HTML and JavaScript, and then write a social application for any partner site. MySpace, Friendster and LinkedIn all committed to OpenSocial. It was believed that with a common set of APIs, it would be easier to extend social functionality beyond the fun and entertaining applications already in evidence to business contexts.[38]

During a visit to New Zealand in early 2006 David Boloker, chief technology officer of IBM's emerging Internet technology software group, claimed that in a decade Web user interfaces would be similar to today's world of gaming. "We'll have the same high quality graphics, and the underlying messaging sub-system. The requirements for a high-quality game today will be the norm of the Internet." Google Earth was an example of such a system. It combined satellite imagery, maps, and information.[39]

In fact in August 2007 Google launched a virtual telescope feature called Sky, which it hoped would turn millions of Internet users into stargazers. Google Earth, which launched in June 2005,

had by August 2007 been downloaded by more than 250 million people. The stargazer's version delivered an astronaut's view that could zoom from street level out into space. "Never before has a roadmap of the entire sky been made so readily available. Sky in Google Earth will foster and initiate new understanding of the universe by bringing it to everyone's home computer," said Dr Carol Christian of the Space Telescope Science Institute, who co-led the institute's Sky team. Like Google Earth, Sky enabled users to float and zoom in on more than 100 million individual stars and 200 million galaxies as seen from earth.

Its different layers showed the life of a star, constellations, high-resolution images provided by the Hubble Space Telescope and a user's guide to galaxies. A backyard astronomy layer let users click through stars, galaxies, and nebulae visible to the eye, binoculars, and small telescopes. The imagery was stitched together from numerous third parties including the Digital Sky Survey Consortium, the United Kingdom Astronomy Technology Centre and the Anglo-Australian Observatory. The imagery would be updated over time and the Sky service was made available in 13 languages.[40]

IBM's Boloker said in the near future Web 2.0 tools would enable people to build applications quickly. "Web 2.0 is a new class of affordable applications that deliver instant value such as mash-ups[41] and programmable Web. It comprised everything from Ajax[42] to social software, blogs and wikis, with a focus on simplicity and ease of use to microformats. Web 2.0 will change the way we look at Web socialisation, mash-ups and usability." Content would come to you dynamically. Broadband and wireless would become one, and the wireless devices we have today will converge, he said.[43]

GET A REAL LIFE

The reasons to go on-line and stay on-line were becoming increasingly compelling. If social networking sites where you voluntarily offered up details of your life to virtual strangers and virtual friends wasn't enough; and real-life friends were suggesting you should 'get a life,' well now you could. A second one. Second Life offered a virtual world where you and you avatar could live a surrogate life in cyberspace, and had gone from curiosity to a mainstream experience in just over a year.

Visitors needed only to download a free program, then log in and take a virtual tour to become familiar with the strange new environment. It had its own malls, media, music, fashion, and real estate. Second Life was a 3D on-line digital world imagined and created by its residents, the site said. Long-time inhabitants created automated tours, opened virtual travel agencies and even published travel guidebooks with sections on how to fly, hover, and even teleport from place to place. Automated tour vehicles ranging from hang-gliders to flying carpets were available to purchase. Cleverly disguised as your customised avatar you could travel to virtual ancient Rome or a range of fantasy worlds where you could interact with other participants, lounge on the beach, dine at a restaurant, dance at a nightclub, or engage in dozens of other intriguing activities. There were 27 different on-line worlds, including Second Life and World of Warcraft. If there were language barriers you simply typed into a text for translation into one of nine languages.

In October 2007 there were nine million residents and millions of literal dollars were being transacted in business from Second Life's Linden dollars every month. Victoria University had its own MediaZone Island where School of Design students could interact. One student was even engaged in a PhD based around collaboration through open source and creative commons technology. The Anglican Church began running meetings in Second Life and among many others Kiwis, the All Blacks and the Mongrel Mob and real estate company Harcourts had established a presence there. IBM had sales avatars servicing customers in New Zealand.

STORING OUR DIGITAL LIVES

A thousand megabytes equals a gigabyte, a thousand gigabytes equals a terabyte, a billion gigabytes equals an exabyte … and a friggabyte is the size of a file that takes far too long to transfer over the Web.
Anonymous

The explosive growth of digital content generated by next generation consumer devices, including digital video and still cameras, DVD and CD writers, and MP3 players, added a new shine to the previously mundane storage market. Storage capacity on laptops, PCs, DVD recorders, flash memory cards, USB drives, and portable multimedia players grew exponentially and prices continued to dive.

Research company IDC estimated 161 billion Gb or 161 exabytes of data was generated in 2006. In its report 'The Expanding Digital Universe: A Forecast of Worldwide Information Growth Through 2010,'[45] released in March 2007, it attempted to account for all the digital documents, photos, videos, emails, Web pages, instant messages, phone calls, and other digital content cascading around the Internet, assuming an average digital file would be replicated four times.

The largest category of digital data was email, including spam, and other person-to-person communications, which accounted for six exabytes or six billion Gb of data in 2006. IDC estimated there were one billion devices capable of capturing digital images in 2006. Approximately 150 billion images were taken with digital cameras, and another 100 billion with cellphones. YouTube hosts 100 million video streams a day and experts say more than a billion songs a day are shared over the Internet in MP3 format.

The two most powerful data trends were the number of Internet users and the speed with which they were connecting. Between 1996 and 2006, the number of Web users grew from a 48 million to 1.1 billion worldwide. IDC predicts that over the next four years, another 500 million people will come on-line.

IDC numbers escalated through the presumption that each digital file would be reproduced at least four times. If it only tracked original data, its result would have been a more comprehensible 40 exabytes; the equivalent of four stacks of books that each reached from the Earth to the sun, or 2.4 million times the information in all the books ever written.

The previous best estimate of the world's digital data was made by researchers at the University of California, Berkeley, who claimed the globe's information production was five exabytes in 2003. One of the sponsors of that report, data-storage company EMC, also commissioned IDC's report. The Berkeley researchers included non-electronic information, such as analogue radio broadcasts and printed office memos, and tallied how much space that would consume if digitised, based on original data only.

IDC predicted that by 2010 about 70 percent of the world's digital data would be created by individuals. For corporations, information was growing from such sources such as surveillance cameras and regulations requiring them to store business records often for many years.

The company estimated that the world had 185 exabytes of storage capacity available in 2006 and would have 601 exabytes in 2010. But the amount generated was expected to jump

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from 161 exabytes in 2006, based on everything being replicated four times, to 988 exabytes (closing in on one zettabyte) in 2010. Fortunately, storage space continues to get more capable and more affordable and not all digital data lasts very long. Spam, for example, pretty soon finds itself in the virtual waste bin and most cellphone calls aren't recorded.[46]

FLASH FLOOD

Meanwhile companies who had the unenviable task of keeping up with this deluge of data were continuing to push the boundaries of capacity, allowing us to squeeze more and more into less space at lower cost. In fact the people responsible for that technology won the 2007 Nobel Peace Prize for their efforts.

France's Albert Fert and Germany's Peter Gruenberg achieved a breakthrough in nanotechnology for using the electrical response from tiny magnets to impact on the way atoms are laid down in ultra-thin wafers, allowing more data to be packed into hard disks. Their giant magnetoresistance (GMR) breakthrough enabled laptop computers to squeeze in more than 200Gb of data, MP3 players to store thousands more songs and dozens more video clips and the memory card market, including Sony, Toshiba, Kingston, SanDisk, Imation, and Transcend, to grow to 8Gb and beyond.

Research company Gartner said 88.2 million USB flash drives were shipped in 2005, and 115.7 million in 2006. In the wake of unprecedented demand, flash memory cards and drives under 256Mb had virtually become redundant as affordable 1Gb and 2Gb units and new 4Gb and 8Gb products hit the market. Prices for SD memory varied wildly. The new entry level in this rapidly evolving market was at least 512Mb ($15–$60). Serious SD storage for cameras and mobile devices started at 1Gb ($20–$30) and even a 2Gb card could be had for $30–$50, less than half the price in 2006.

Meanwhile new 8Gb SDHC (high capacity), which had only been around for a short time and 8Gb Compact Flash cards were 50 percent down on 2006 at $120–$200. There were even 16Gb CompactFlash cards for $250. In fact that capacity was increasingly being used to capture and transfer home movies.

Hard disk capacity on PCs was accelerating to the point where 500Gb was normal and some media centre computers had a terabyte of internal storage. External storage was also growing at an astounding pace. In 2005 you would have paid around $300 for a 200Gb external drive, for the same price you could get 500Gb from mainstream storage suppliers such as Seagate, Western Digital, Maxtor, and Hewlett-Packard. In fact you could get external terabyte drives – that's 1000Gb – for $550–$650 to store your music and movies and back up your system.

To cater for those wanting on-line storage, Google began offering up to 1Gb free storage space with its Gmail service when it launched in April 2004. In Google's own words: "Don't throw anything away: 1000 megabytes of free storage so you'll never need to delete another message." Google's free Gmail service became even more open in early 2007, when it shed the remnants of its invitation-only restrictions and began adding other core products including instant messaging and calendar management.

Google believed it had adequate computing capacity to accommodate the generous amount of free storage

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provided by the email service after investing heavily in additional data centres. Gmail upped the capacity available to each account to at least 2.8Gb of on-line storage. Google's photo-hosting service charged $25 annually for 6.25Gb and $500 annually for 250Gb. "We can't afford to give away everything for free," said the company. Statistics compiled by the research firm Comscore indicated Google had surpassed AOL to become the world's third largest email service behind long-time leaders Yahoo!, and Microsoft.[47]

Then in October Google had to ramp up again. Microsoft had also upped its free storage limit for Windows Live Hotmail service to 5Gb, and Yahoo! was offering unlimited storage. Dozens of other providers were also offering free storage for images and documents, accessible on-line from anywhere to keep customers coming back.[48]

Technology providers were looking at every possible way to facilitate the trend for more storage, so there was little chance of running out of space. Removable hard disks (512Mb–2Gb and beyond) had become so small they looked like jewellery, and many people were in fact wearing them around their necks or on key chains. Plug in your headphones and these devices could double as MP3 players. The newest class of device, the portable multimedia player with a screen for watching movies, managing your music or other files, took things a big step forward.

Cellphones had also morphed into cameras, but had been a poor substitute for the real thing. That, however, was also changing as pixel-capturing capability grew to 3–4 megapixels and beyond. According to IDC Research cellphones with cameras had made photography fashionable again, with customers now looking at higher-quality cameras. The trend towards single lens reflex (SLR) cameras, more attuned to the professionals or serious hobbyists, was also moving faster than expected.[49] The number of images captured on consumer digital still cameras in 2006 exceeded 150 billion worldwide, while the number of images captured on cellphones hit almost 100 billion.

IDC was forecasting the capture of more than 500 billion images by 2010. But the trend had left empty pages in scrapbooks and photo albums, as data was captured instead on CDs, DVDs, computer hard drives, email boxes, flash cards, and of course on-line.

As new players battled for market share there was a suggestion that combination phones might eventually win the battle over portable music and video players. Nokia sold more music phones (70 million) than Apple sold iPods worldwide in 2007 and Apple, hedging its bets with iTunes, iPod players (46 million) and its new iPhone, seemed to be pointing the way forward for the mobile market.

Some were even predicting the end of the line for stand-alone portable music players, and the rapid arrival of faster 3G mobile networks was expected to be a major factor. In its analysis of the portable music market, the Diffusion Group said there were no fundamental technology limitations preventing the cellphone from becoming an excellent portable music player. When converged devices work well, they are generally cheaper than separate products. Cellphones were also coming down in price and often subsidised by carriers and flash memory had become inexpensive enough to provide sufficient storage for most portable music needs.

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"Within the next few years, demand for stand-alone portable music players will peak and begin to slowly fade into the background; within ten years, these devices will be relegated to museum shelves next to the vinyl LP and the eight-track player. What will take the place of the iPod? Your mobile phone," said researcher Brion Feinberg.[50]

As smartphones with Web browsers, email, organiser, camera, and music players get smarter with GPS navigation, more storage, bigger screens, and double as TV receivers hooked up to faster wi-fi and broadband networks, why would you want two devices?

VIRTUAL SNOBBERY

While the social networking trend was clearly achieving mass market momentum, it was also raising concerns about its impact on youth, as new forms of elitism and bullying emerged. Wellington High School guidance counsellor Mark Pope said it was having a similar impact to cellphones. "The more names teens have in their phones, the more popular they feel. This does create a kind of anxiety to look as though one has more friends."

Susi Maclean from Christchurch PR firm Glass Tower Strategic Communications said the idea of friend envy came from the way people increasingly see themselves as a brand. "If you don't have legions of friends on your Facebook page, how successful is your brand?" Auckland actor and former *Ready Steady Cook* presenter Clayton Carick-Leslie said if someone had a friend who looked interesting "and fun" there was always a slight tendency to want that person on your web site too. "Although one of the worst things about Facebook is being rejected by people who you want to be friends with, the other frustrating thing is being signed up by people you left behind happily at primary school."[51]

There had long been concerns about young children being victimised by paedophiles and other predators in chat rooms and interactive sites. The Internet Safety Group expressed its alarm at the number of children in New Zealand who ended up having face-to-face meetings with people they had encountered on the Internet. In the 2002 publication *The Net Generation: Internet Safety Issues for Young New Zealanders*, the biggest survey of its type, it was revealed 23 percent of Internet-using children between the ages of seven and ten had a face-to-face meeting with someone they met on the Internet, rising to 37 percent in the 16-plus age group.

Internet Safety Group spokeswoman Liz Butterfield said she was shocked by the high number of youngsters meeting someone they encountered on the Internet. "Some are not even employing safety strategies, not even half told their parents, and if all they did was tell a friend, then I'm worried. Do they understand how little they know about that person? The Internet gives people a feeling of intimacy, they feel the other person knows a lot about them, but they forget they've never laid eyes on them or heard their voice." The survey of 2500 young people found 7 percent felt unsafe or threatened, some suffered physical harassment and others wanting to meet a girl suspected their 'friend' lied about their sex. Of those who felt unsafe only 20 percent told a parent.[52]

By May 2007 more than 2000 New Zealand schools had taken steps to limit student access to the Web, as concerns grew over social networking sites like Bebo. Ministry of Education figures showed at least 2300 schools had filtering software installed to stop students accessing sites deemed by the school to be inappropriate. The bans came after growing concern about Bebo, YouTube, and MySpace, some of which had featured fights in New Zealand playgrounds or photos of students in provocative poses. Schools were trying to educate parents through school newsletters and specific letters to the home to become more aware about what their children were doing on computers at home.[53]

SOCIAL SHIFT IN PROGRESS

We were clearly experiencing a major social shift in the means of communication and sharing information. Mostly there was a genuine exchange of desirable data but as in the real world, there's always a wild side on the Internet. Cellphones with cameras were being used to cheat in exams, or post candid and at times unpleasant or invasive images on the Web; prisoners were using cellphones to organise drug deals from behind bars or send images of life inside for publication on public access sites.

Young people were using social networking sites to bolster egos and hit rates, pushing the boundaries; crazy exploits, speeding vehicles, bonnet surfing and bizarre, *Jackass*-inspired shock antics were commonplace. Just as text messaging had its downside with text bullying, with private gatherings transformed into riots as email lists notified gatecrashers of the next weekend party, so low-res videos published on public sites were also causing problems. Bashings were being filmed and posted, and text alerts were being sent out pre-bashing so there was an audience for what would later be posted.

A schoolboy whose assault was videoed and placed on YouTube web site told the Hastings District Court he had expected to get "a hiding" but hoped he could talk his way out of it. The youth, whose name was suppressed, was assaulted at a Hastings park on 30 March by two brothers and several others who had been alerted by text-messaging to the prearranged fight.

> *"I didn't want to get beaten up … I felt scared and nervous." The youth was surprised to find between 30 and 40 young people waiting at the park. "People I didn't even know were coming up and saying they were going to dig my grave," he said. The fight was initially delayed until someone arrived with a video camera. The victim was searched to see if he had any weapons on him then punched and knocked to the ground by the older brother and kicked numerous times by others in the crowd as he lay on the ground. PC Bradley Clark, who investigated the assault, said he watched the YouTube footage about 40 times while trying to identify the offenders. And 18-year old Flaxmere youth Jerry Putaranui denied the assault but was convicted by Judge Bob Wolff.[54] Putaranui was later sentenced to 100 hours of community work and placed under nine months' supervision to allow him to take part in anti-violence and anger-management programmes. The two brothers involved in the assault were also charged and sentenced to community work.*

A West Coast rugby league player was banned for eight matches over punching and kicking an opponent at a game in August after the video was posted on YouTube:

> *Loose forward Matthew Sweeney was suspended for the rest of the 2007 season and the early part of the 2008 campaign for his brutal actions. Sweeney was involved in an altercation with a member of the opposing league team and sin-binned but then he punched his rival in the head, knocked him to the ground then hit him again before being dragged away by team mates. It was all captured on camera and posted to YouTube which later took the footage down.*[55]

Speedsters who had clocked up to 160km on the open road and boasted about it with giveaway footage got booked and even thieves were being found out on the Web:

> *A video of a man stealing a laptop computer from a shop window display, posted on the web site YouTube has resulted in a conviction for theft of Dawson Anthony Bliss, 50 of Hastings. The Greymouth District Court was told a man viewing the video recognised him as the thief.*[56]

And then ultimately the social networking site Bebo was used to help in a murder investigation but the response from the law also showed a degree of naivety in requesting the global social

networking site shut down debate on the case, which in turn provoked even greater on-line participation, making a mockery of an attempt at name suppression.

Police want the Bebo web site to shut down talk about the killing of Augustine Borrell, which continues to buzz despite a judge's warning about a suppression order. Messages on the social networking site now include a wave of support for the alleged killer, an Otahahu 18-year-old. They breach the court order suppressing his identity and contain material that could prejudice his chance of getting a fair trial. Teenagers began discussing the killing within hours of Augustine being stabbed in Herne Bay. His friends used Bebo to confront the accused which elicited a response from him. An on-line 'lynch-mob' of hate mail followed and he handed himself in. Police had approached Bebo's US head office to see if it could stop the posting. It was conceded there could be difficulties in enforcing the order given it was not a New Zealand company.[57]

The *NZ Herald*'s Patrick Gower claimed New Zealand teenagers "use their Bebo sites to boast about their wannabe street gangs, abuse the police and show off their guns and drugs … A series of clicks through a wide network of Auckland teenagers reveals many of their Bebo pages are firmly linked to a Los Angeles-style 'gangsta' culture … with photos of teenagers toting guns, or of bags of ecstasy and P. Many displayed photos of wall-sized tagging they have done around the city."[58]

PANDORA'S WEB

The Internet is an extraordinary leap forward in freedom of communication. It bypasses national, political and social boundaries; it is at once Pandora's box and the biggest reference library in the world. It is the greatest tool for sharing the latest research and news events, and the most confusing source of disinformation and lies ever devised. The on-line experience can be exhilarating, mind expanding and at times downright dangerous. People are talking across all boundaries; geographical, racial, political, social, and sexual, and sharing so much about their likes, dislikes, personal habits, and sensitive data that it is often an invitation for trouble.

Security firm Sophos conducted an on-line survey about how seriously users took the strict privacy settings on social networking sites and was surprised to discover most were are all too willing to accept strangers as friends. The survey found more than 40 percent of Facebook users would accept a 'friend request' from a complete stranger, and more than three-quarters revealed their date of birth, address and information about their education or employer. Some exposed complete CVs and even their mother's maiden name, a detail often used by banks and various on-line services to help users retrieve forgotten passwords.

Sophos's head of technology, Paul Ducklin, warned personal details on social networking sites could be used maliciously by thieves to impersonate the user, after which they could obtain passwords for on-line accounts and access employers' private computer networks. The details could also be used to develop highly targeted phishing emails, to convince people to give up sensitive information like credit card details. While both Facebook and MySpace allowed users to restrict profiles so their information could only be viewed by approved 'friends,' the general definition of a friend on the sites was too loose, and people were too quick to approve friend requests from strangers.

"Just because it looks like someone you might like or know or be interested in, it doesn't mean that it is. You actually need to take some reasonable steps to find out whether someone who wants to be your friend is actually someone you want to be friends with," said Ducklin. People were learning to be suspicious of email and spam messages but they needed to keep those same lessons in mind with social networking. For its experiment Sophos created a fabricated Facebook profile under the

name Freddi Staur (an anagram of 'ID Fraudster'), a green plastic frog who divulged minimal personal information. Sophos then sent out 200 friend requests to random Facebook users. Eighty-seven accepted.[59]

Sites that valued their reputation and wanted to create a safe environment for users were involved in an ongoing vetting of membership. In May MySpace deleted about 7000 user profiles that belonged to convicted offenders. In August 2007 it detected and deleted a further 29,000 convicted sex offenders from its service. The service had come under attack after some of its young members fell prey to adult predators posing as minors. The families of several teenage girls sexually assaulted by MySpace members sued the service in January for failing to safeguard its young members. The company struck a partnership with background verification company Sentinel Tech Holdings to co-develop the first US national database of convicted sex offenders to make it easier to track offenders on the Internet. The minimum age to register on MySpace is 14.[60]

Virus and spam protection, search tools, and sharing capabilities are getting more sophisticated, but the Internet still requires new levels of discernment, information sifting and research skills, and a new on-line ethic. So what do you do with the Internet? You can't shut it down, or legislate against it. That's like trying to staple jelly to the wall. As with TV you can choose your channels and content, learn to respect the no-go zones, and focus only on sites that are valuable and informative and uplifting for your particular purposes.

Freedom of access and information comes at a price. Instead of always asking governments and the law to deal with the nasties, perhaps it's time to police ourselves, ensure we have the latest security updates and to develop a 'culture of trust' where we become more discerning about the sites we visit and the people we communicate with on-line.

As the blogger on Scoopit said, "We who use it daily, quickly learn how to navigate around the piles of rubbish, lurking fraudsters, lies and malice and vapidity and perversion. It is a vast teeming city, and you can choose whether to frequent cathedrals, theatres and parliament or just the brothels and public hangings."

The alternative is unless we get a conscience, undertake a moral inventory, learn some manners and self police, within five years governments and international enforcement bodies will close in and replace the unfettered global free-for-all with their own set of rules and taxes, backed up by hi-tech surveillance that can trace illegal, undesirable, or subversive material right to your desktop.

19

Mobile momentum

Weaned off the wires

The question has to be asked, if there is a lot of revenue in the market and a lot of profit to be chased then why don't we have three, four or five mobile carriers?[1]
IDC telecommunications analyst Chris Loh, 2006.

(Mobile speeds) will jump to five, 10 and then 20Mbit/sec in the next year or so but we won't see 100Mbit/sec for at least five years. This is all part of the roadmap for wide-band CDMA.
Nokia Siemens New Zealand account manager Mike Smathers, 2007.[2]

Just 25 years after the mobile market got its first competitor, there was every indication of a swift transition away from fixed-line connections to wireless and cellular networks that would seamlessly hand off to each other and deliver considerably more than voice and Internet.

Rich new ways to share data were apparent early in the new millennium as consumers moved up to latest generation mobile phones. In fact the term 'phone' was becoming an anomaly, as these multifunctional handheld devices were MP3 players, sound recorders, video and still cameras, digital assistants with email and Web clients, and video-conference terminals. With the growing capacity of memory cards, they were able to store huge amounts of data.

There were more than three million mobile-phone users in New Zealand with Telecom and Vodafone roughly splitting the market and continually looking at ways to improve their edge. The overall cellular market was estimated to be worth around $2 billion. New Zealand had reached saturation point for phone penetration with over four million phones in the market, more than enough for every man, woman, and child. The numbers, however, included a million connections relating to second phones, phones that were no longer in use, or cellular links for business or applications such as security monitoring. Many customers had one phone from each network to take advantage of their various special offers.

Future growth, reliant on next generation phones and faster speeds, appeared to be stifled by high calling costs, incompatibility between existing CDMA and GSM networks and the lack of a long-promised third competitor. Potential third network players had made empty promises for years but

by the end of 2007 relief was in sight, with plans to regulate the mobile market and at least three new mobile players allegedly waiting in the wings.

Telecom and Vodafone remained at each other's throats, expanding the capabilities of their networks to more locations, boosting their marketing to appeal to youth with pxting , video services, mobisodes, and music downloads, as well as improving roaming agreements for more affordable global coverage. The battle for customer attention and retention was only expected to get fiercer, as carriers looked to speed, mobile-landline-wi-fi handoff, next generation location-based services, videoconferencing, and bundled services including landlines and fast Internet.

The Commerce Commission had been formally investigating ways to achieve improved competition and pricing. Both Telecom and Vodafone were under pressure from the government and consumers to bring their prices down to a more acceptable level. New Zealand mobile phone prices were among the highest in the developed world; 70 percent higher than the OECD average, and the second highest in the developed world in 2005, 2006, and 2007. It was hoped new rules of engagement would have the same impact on the mobile market that unbundling Internet access was having on broadband.

AMPING FOR THE FUTURE

Achieving mobile network competition in New Zealand mirrored the obstruction, delays, and tactical parrying that had slowed uptake of competitive phone calls and dial-up Internet.

Having acquired spectrum in 1989, wholly US-owned BellSouth New Zealand invested nearly half a billion dollars into building its nationwide cellular network through an 'islands of coverage' strategy, where the most densely populated areas were served first. Once issues of leakage into the Telecom network were resolved, BellSouth mobile went live from 11 July 1993 under the slogan 'This is Tomorrow,' deploying new digital mobile technology, known as GSM.

It was up against Telecom's Advanced Mobile Phone System (AMPS) analogue cellular network. A year and a half later it had achieved 80 percent coverage and was moving data as well as voice, claiming 10,000 customers. By 1995 it had added 20,000 more customers.

It was a hard slog, and in retrospect BellSouth managing director Keith Davis doubted the company would have gone ahead with its plans for New Zealand had it known the difficulties that lay ahead in its battle with Telecom. "This is not a deregulated environment," Davis complained to *Wired* magazine writer Bob Johnstone in mid-1995. "This is an environment where the power of regulation has been passed to the incumbent." BellSouth found itself at the mercy of Telecom with no government offices to which it could send its lobbyists. There had been some rude shocks since its network went live.

In order to deploy international roaming, BellSouth had to ask Telecom to provide the necessary authorisation signals. It alleged Telecom's engineers had stalled the process in order to give their colleagues time to patch together a competing product. "Business is all about time," fumed Davis. "The whole cornerstone of Telecom's policy is delay." Another thing that bugged Davis was the interconnect agreement BellSouth signed with Telecom. "It's unfair ... We're a network operator, yet they charge us full retail rates for interconnect, while their resellers get a 20 percent discount for carrying calls." This is not the level-playing field that Davis claimed the Godzone Government promised BellSouth, whose market penetration remains very small.[3]

By 1996 BellSouth claimed 95 percent coverage and around 40,000 cellular customers, or 11 percent market penetration, compared with Telecom's 300,000 customers. Then, after much speculation, the news was out: Vodafone had won approval to acquire BellSouth New Zealand for $750 million in November 1998. Vodafone was the largest cellphone company in the United

Kingdom, and one of several bidding for BellSouth after its US parent decided to quit Australasia. It had never made a profit, although it was expecting to inch into the black in the year of sale. It had over 120,000 customers – about 18-20 percent of the cellular market – compared with Telecom's 492,500.[4]

Communications Minister Maurice Williamson explained he was always trying to negotiate a fair path between Telecom's intransigence and BellSouth's bickering. "I had some lunatic companies trying to do things that they literally weren't set up for. BellSouth came here and tried to run a cellular phone company and for six years they bagged me on a daily basis: 'It's not possible to make progress. You need to regulate. You need to give us access to their network. You need to get customers on our books because we just can't function.' I found it interesting because they chose to come here and invest, knowing what the regime was. If I had changed it, they'd have every right to be grumpy. I said, 'I'm sure you guys are smarter at investing than I ever was.'

"In the end, BellSouth gave me the final ultimatum. Really nasty. They brought in the big boys, the finger-pointing, the lawyers and so on. 'If you don't do something, we're outta here. We're going to walk from New Zealand. How do you think that will look?' I said, 'Well, I'll be disappointed if you do, but if you do I can't stop you and I most certainly am not going to get into regulating, moving wealth from one balance sheet to another.' Then the news came out in the papers three months later about the $750 million sale to Vodafone. Vodafone arrived, the bosses came to see me the following week and said, 'Can you do us one favour?' Can you stay right out of the market in terms of regulating and controlling? We want to win our customers the old-fashioned way with price, product and service.'

"Well that was a refreshing change. They were only 18 percent of the cellular market, but they were confident that within five years they would be the biggest cellular provider in the country. It had nothing to do with my failure to regulate, they were sold to a new owner and had a totally different, fresh approach to their customers and products and services and they got all the young kids involved," said Williamson.[5]

Vodafone in acquiring BellSouth took ownership of 138,000 customers and a leading-edge digital GSM system, which allowed paging, messaging, and email, and was a serious leap ahead of Telecom's analogue service. Its phones could also be used in New Zealand and Australia and most of Europe.[6] Telecom had the market numbers but was still in serious catch-up mode as far as delivering a digital service went. Meanwhile a third cellular player, Telstra, the international arm of Telecom Australia, had acquired bandwidth and was planning to have its own GSM service but ended up doing a deal with Vodafone, which provided a service in exchange for access to the spectrum.

CELLPHONES GET SEXY

Cellphones suddenly became sexy – they were no longer just symbols of yuppiedom. A whole new generation of converts had gone mobile with voice calls only making up part of the picture. Technology was squeezing more into less as the cellphone – once tagged the brick because of its unwieldy nature – became a personal fashion item that slipped comfortably into jacket pocket or purse.

New Zealand cellphone penetration slowly moved from 10 percent in 1995 to 17 percent in 1998. Serious momentum began after Vodafone bought GSM operator BellSouth, trebling its customer base in the first year. It introduced prepaid phones and dropped prices forcing Telecom to lift its mobile game. In June 1999 Vodafone announced it would spend $200 million over the next two years to upgrade its cellphone network to cope with increased demand. Telecom followed suit in August with plans to replace its mobile telephone network with new CDMAOne digital technology.

Vodafone and Telecom released figures showing huge growth in the number of mobile phone connections in the last quarter of 1999. Vodafone's connections grew by 35 percent in the three months to 31 December 1999 to reach 397,000 while Telecom's mobile connections grew by 13 percent over the quarter to reach 858,000. By the end of 2000 more than 41 percent of New Zealanders owned a mobile phone, up from 27.6 percent in September 1999. Vodafone now had close to 638,000 customers, blossoming to 900,000 by mid-2001, while Telecom's subscriber base also grew rapidly to over a million with more than 300,000 using its digital service.[7]

The major driver from the latter half of 2000 had been the speed young people in particular had embraced SMS, more commonly known as text messaging. Up to a million text messages were being sent between cellphones every day. A new language of shortcuts, like in the early days of the telegram, was being used for efficiency and to squeeze as much information into the allowable size for each 20-cent message. The abbreviated words became a kind of teenage code between students in university lectures, between friends arranging to meet, or for passing on sensitive data or gossip. However there was still no agreement for interchanging messages between Vodafone and Telecom's new digital CDMA network.

SMS was the stepping stone to more sophisticated services using the WAP, which could take advantage of next generation cellular networks. WAP was the standard for integrating the Internet with cellphones, pagers, and other digital mobile devices. Its micro-browser displayed key information from specially designed web sites.

IDC Internet researcher Patrick Pilcher said it was only a matter of time before you could order pizza, place a bet on the TAB or participate in an on-line lottery. Weather, news, and share prices were among the first applications. "One of the first major WAP applications in the world was developed here by Hewlett-Packard. In March 2000 Ericsson got permission to test technology capable of transmitting high-speed Internet and videoconferencing at 472kbit/sec, making New Zealand the first country to get a glimpse of a working third generation (3G) system."[8]

Both carriers had their goals set for 3G mobile networks and the services that would run on them. The cellular market was proving lucrative – the average cellphone was typically used for 18 months, then discarded for an upgrade. Vodafone's My Vodafone portal had fax, email, and was soon to provide mobile banking, news, and weather. Users got their own email address and accessed information from their cellphone or PC. Newcomer iTouch was ready to deliver 'alerts' for news, sports results, and the share market, and Ericsson's e.Zebra.net had a similar stable of text services. Key content providers included the much improved *NZ Herald* site and TVNZ's revamped nzoom news and information portal. Telecom had plans to extend data beyond its AirNote service through network enhancements in 2001.[9]

Vodafone was upgrading its GSM digital network to use General Packet Radio Service (GPRS) technology to enable Internet access at speeds up to 100kbit/sec and Telecom planned an upgrade to a digital CDMA service during 2001. Both carriers were keen to continue extending their networks up to 3G services, which would enable even faster surfing and greater functionality on mobile devices.

In mid-2001 Gartner Group believed wireless Internet would have a billion users by 2005 and suggested phones with the capabilities of a pocket PC would drive exponential growth. IDC was convinced Internet-connected mobile devices and m-commerce were the next big thing, expecting 419 percent annual growth in mobile revenues from US$29 million in 2000 to more than US$20 billion by 2004.

The humble cellphone was becoming an indispensable part of our lives as we sought closer contact with family members, business associates, and customers wherever we were. Vodafone launched its GPRS network in June 2001 and designated New Zealand a global centre of excellence to test the way forward to 3G. It had partnered with Clear Communications and TelstraSaturn

to resell its business-based mobile services including transport and despatch systems, tracking and logistics and mobile workforce productivity, typically accessed from a handheld computer connected to a GPRS phone. A major shortage of phones was slowing the uptake, but mobile devices with GPRS chips were about to open up a raft of new opportunities.

As part of an evaluation of its offshore investments, Telecom pulled the plug on a $151 million plan to roll out a CDMA wireless network in Australia, instead taking a 19.9 percent stake in Hutchison 3G Australia, a company set up to develop 3G services there. Locally, having invested $200 million, it launched its CDMA network in July 2001, covering more than 98 percent of New Zealand's populated areas. Subscribers could take advantage of secure transactions, custom-built business applications, email, news, weather, games, entertainment, a what's on section, horoscopes, share prices, and a pay-per-use Web portal. Telecom had upstaged Vodafone by reducing the cost of downloads. Vodafone's casual rate was $30 per Mb, or up to 30Mb within a $190 monthly plan compared to Telecom's casual rate of $8 per Mb, or a monthly plan of 70Mb for $100.

The pricing war was complicated by the need for speed. Telecom's CDMA (14.4kbit/sec) was faster than Vodafone's existing GSM network (9.6kbit/sec) and had stronger in-building and sea coverage. Even its next generation service had an edge over Vodafone's GPRS, delivering only 20-40kbit/sec compared with up to 100kbit/sec for Telecom's CDMAOne upgrade. There were 537 million subscribers using GSM phones around the world, mainly in Europe. For CDMA, focused on the United States, there were 90 million subscribers. Both had strong growth in 2001.

There were many distractions in the alphabet soup of acronyms and sci-fi promises. Greater awareness of global trends, fear of built-in redundancy, and a slowdown in the tech markets were fuelling a healthy scepticism. Around the world telcos and equipment manufacturers were under serious financial pressure as they slashed staff numbers, restructured, and re-focused. They had invested hundreds of billions for 3G spectrum rights, and now had to build those networks in an uncertain environment. Major consolidation was ahead.

While Telecom and Vodafone had their eyes fixed on 3G nirvana, they also had the billion-dollar challenge to cover New Zealand's rugged terrain. There were challenges ahead for next-step networks. Which carrier would offer the most useful solutions to real world problems at the best price? A killer application to drive things forward was still missing. No one wanted to invest in applications that ran on one platform, only to find their customers and business partners were using the other flavour. Did users really want to receive important business information on a cellphone with a tiny screen, cramped keypad, and awkward interface? And what about the next wave of hype – video on your phone? At $8–$30 per Mb, it didn't seem particularly inviting.[10]

BECOMING TXT ADDICTS

The mobile phone market levelled for a while from mid-2001 through to 2002 when vanilla phones, basic communication, and some enhanced services were all the carriers could offer. As they moved their digital networks up a notch or two, however, they found dozens of ways to add value.

Prices for standard cellphones had dropped so far that everyone could afford one. They were even being given away by the networks to encourage subscriptions. After a stalemate there was now an agreement in place to exchange txt messages between networks. Everywhere you went people were txting each other. For example 260,000 texts were sent as part of a Telecom promotion in the first two days of the Louis Vuitton Cup in 2002.

Telecom's next generation CDMA1x network launched in July 2002 was capable of 153kbit/sec with coverage across 97 percent of country. Just 14 months later it had more than 200,000 customers

on board. The battle was on to encourage users to move up to Telecom's 027 and Vodafone's 021 (029 to TelstraClear customers) next generation digital networks. The latest craze was pxting or sending images across the networks at 50 cents a time with phones that could link to a PC card or digital camera. With this capability you could send an image from a cellphone to an email address anywhere in the world.

Cellphone mobile penetration was well over 60 percent. Both major carriers claimed they were now leading the market; one set of statistics showed Telecom with 1.3 million (analogue and digital) and Vodafone 1.2 million. Call plans were similar across both networks; the most popular was a monthly fee of $35 for 200 off-peak call minutes and a two-year commitment or a prepaid offering requiring regular $20–$50 top-ups.

Smarter, smaller, sexier cellphones, we were told, were needed to access the growing number of sophisticated services being offered. The new generation WAP phones were not only functional but fashionable, coming in a rainbow of shades and patterns with snap-on bodies and endless accessories ranging in price from $250 to $2500 for all the bells and whistles – snap-on camera, fax, email, SMS, Web browsing, and integrated PDA.[11]

The attractiveness and usefulness of next generation cellphones was even having a major impact on the sales of PDAs as the all-in-one communications and computing device. The handheld PDA and mobile market had declined 10 percent year on year worldwide, while smartphones had achieved 239 percent growth in the data transmission area with Sony and Nokia leading the way.

There were a growing number of convincing reasons why old-style analogue phone users should move up to digital, including clarity, text messaging, Web browsing, taking photos, and impressing people at cafes with the latest polyphonic ringtones. The battle for content was heating up. Vodafone Live! and Telecom Mobile Services were both delivering a growing suite of offerings including sophisticated games and consumer services.

In November 1999, fewer than 60,000 txt messages were sent across Vodafone's network daily, but by the end of 2003 it had reached 1.8 million. The ability to send images was also helping to shift the image of the cellphone from voice only, with tens of thousands of images a day moving about the networks. The same reluctance for sharing across networks had arisen with a solution on pxting taking time to work through.

The New Zealand mobile phone business was estimated to be worth $1.7 billion. To June 2003 penetration was at 67.7 percent with Vodafone and Telecom on a relatively equal footing, sharing around 2.5 million connections. Telecom had more than 400,000 callers on its digital 027 network and the remainder on its analogue 025 network, which would eventually be phased out.

CAMERA PHONES COMMON

According to wireless industry analyst ARC Group, by the end of 2003 more than 55 million consumers worldwide would own camera-phone handsets – more than double the 25 million mobile units sold in 2002. The growth would come from existing mobile phone users replacing their handsets with more feature-rich models, rather than first-time buyers. ARC said 15 percent of handsets worldwide featured built-in cameras and predicted that by 2005, 130 million handsets with camera capability would be shipped globally; with the additional boost of 3G roll-out this was expected to increase to 210 million by 2008.

The future promised better image sensors, more on-board memory for picture storage, longer battery life, and network improvements to make picture sharing easier. Solid growth was expected over the next five years when smartphones would be commonplace and camera phones ubiquitous and most likely integrated into smartphones.[12]

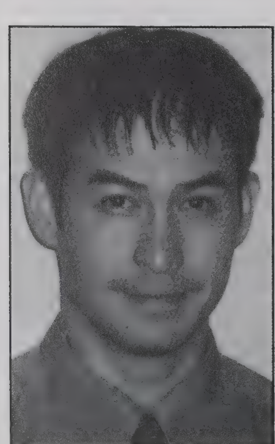
Momentum was mounting for mobile to rival wireline communications with the next generation of cellular networks optimised for multimedia content, and handheld computers that doubled as telephones. During 2004 the mobile networks were increasingly focused on the upwardsly mobile who liked to have everything literally at their fingertips, no matter where they were. Field workers were being liberated from the office with real-time access to databases, work scheduling and order taking via laptops or handheld devices.

Home users were offered a much greater range of entertainment and information; browsing, email, novelty ringtones, games, and information services from news to restaurant and movie guides were essentials. The next level meant newer phones doubled not only as cameras but MP3 players, sound recorders, and organisers. People upgrading to second or third handsets with leading-edge multimedia features kept the market strong. Some even had one of each to take advantage of the different deals being offered; for example Telecom's $10 texting which allowed 500 texts to be delivered a month compared to Vodafone TXT 150 for $25 a month.

New Zealand had, however, been sternly criticised for having among the highest costs for landline-to-cellular calling rates, and the Commerce Commission was looking at ways to get these down. The rates for exchanging calls between networks had been as high as 27 cents per minute and the Commission was recommending a drop to around 16 cents a minute. It estimated consumers could benefit $185–$217 million through lower mobile and land-to-mobile charges. An MED report claimed New Zealand mobile prices were among the highest in the OECD, with users paying 46–80 percent above the average.

The real reason carriers were charging more in New Zealand was because they could, quipped Australian researcher Paul Budde of BuddeComm. He cited an unfavourable mix of unregulated mobile market, a duopoly comprising Telecom and Vodafone, and the absence of technology platform competition (Telecom used CDMA and Vodafone used GSM) as the true features of a market that made consumers ripe for the picking. It had nothing to do with geography and population dispersion as the operators claimed.

Telecommunications Commissioner Douglas Webb said his office had been concerned for some time about the high cost of mobile, and the low level of use compared to other OECD countries, but fixed network issues had occupied most of his time. The next step he suggested was removing roaming and co-location services as barriers to entry, possibly through regulation. "New Zealand mobile prices are above the OECD average and appeared consistently across all user types to be higher than we would expect if this market is competitive," said Webb.



IDC Research telecommunications analyst Chris Loh.

The introduction of number portability across the market was also expected to make a difference when it was introduced in April 2007. Both carriers conceded the OECD numbers looked bad but pointed to the fact that the average price per call had been rapidly trending down over several years, and the cost of mobile build-outs costs hundreds of millions of dollars. IDC telecommunications analyst Chris Loh agreed mobile pricing had improved but shouldn't be allowed to overshadow a more important subject: the absence of new mobile entrants. "The question has to be asked, if there is a lot of revenue in the market and a lot of profit to be chased they why don't we have three, four or five mobile carriers?"[13]

Meanwhile both carriers were investing millions into 2.5G and 3G cellular networks that took the brakes off mobile capabilities,

opening the way for faster data and a host of new services that rivalled those on broadband Internet. Vodafone was spending about $400 million on its wide-band CDMA 3G network, which would go live in the main centres in 2005. It had a 55 percent share of the mobile market with 1.6 million customers for its 021 GPRS network with data speeds of 40–60kbit/sec. It planned high-speed mobile data services, high-quality music, video clips and full videoconferencing. Its W-CDMA network promised a top speed of 384kbit/sec, although the average would be much lower than that.

Telecom's new 3G EV-DO (evolution data only) mobile network was rolling out in the main centres. The $40 million investment in technology was largely an upgrade of its existing 027 CDMA1x network which offered 80–155kbit/sec throughput. EV-DO, marketed as T3G, would have a top speed of 2.4Mbit/sec but an average of 500kbit/sec. It would initially focus on business customers for data access through PC cards in laptops and handheld devices. Telecom planned business and entertainment services including video messaging, film, music and sports clips, information services, and television on the handsets along with the ability to talk to several people at once and use the phones as a walkie-talkie.[14]

NETWORKS LIFT GAME

The once humble cellphone had not only broadened its brief to handle Web surfing, music downloads, video clips, and a range of information services, but was positioning to complement or even replace the fixed-line home phone.

Revenues from traditional cellular voice services were starting to slow by the end of 2006, forcing Telecom and Vodafone to become technically and culturally more creative, with new levels of service. The Commerce Commission, for example, had given Vodafone the go-ahead to expand into the high margin, multi-billion dollar fixed-line market.

Research showed about 15 percent of New Zealanders used mobiles for home and business calls, compared to the trend across Europe where 50 percent of people used their mobiles for most of their calls. By June 2006 Telecom was claiming 1.8 million mobile customers with revenues of $709 million and Vodafone 2 million customers and $1.1billion in revenues from the cellular market.[15] Telecom said 30 percent of voice calls were now being made at home on mobiles. The number was around 50 percent in Scandinavia and the United States.[16]

The announcement in October 2006 that Vodafone had snapped up Internet provider Ihug for $41 million gave the network an edge as it looked to broaden into fixed-line and broadband. Vodafone planned to assign its mobile handsets seven-digit local calling codes, to access landlines from within a 100 metre 'homezone,' for free local calling. Telecom had similar plans for mobile-fixed offerings 'at some stage.' Its first move came early in 2006 when it allowed home phone users to nominate one Telecom cellular number for inward and outward calls for $10 a month.

In February 2007, after separate investigations by the Advertising Standards Authority, both Vodafone and Telecom were found to have misled their customers. The Telecom advertisement promoting its Freedom Plan stated customers could call between a Telecom 027 mobile and a Telecom home line as much as they liked for $10 per mobile per month. But the small print said "normal charges apply after 60 minutes." The Complaints Board found the ad to be misleading. Vodafone's 'best mate' ad, which offered customers the opportunity to call, video, and text another Vodafone customer for $6 per month, was also found to be misleading, as the ad did not state the plan was only available to prepaid customers.[17]

Meanwhile both carriers were again upgrading their respective cellular networks and announcing new speeds and charges. Vodafone was spending more than $200 million to up the

Vodafone chief executive Russell Stanners.

broadband cellular stakes. Its W-CDMA mobile network launched in August in 2005 was facing a major upgrade using HSDPA (high speed download packet access) technology which hiked up its throughput, in optimal conditions, to between 1.6Mbit/sec and 7Mbit/sec. Its existing 3G broadband network was delivering average speeds of 800kbit/sec–1.4Mbit/sec. Charges began at $30 a month, but required a 'Vodem' for the PC or Mac, a special laptop card, and a 3G router to share the higher speed connection with other devices.[18]

Telecom began work on upgrading its national cell sites in February 2006 to broaden coverage for enhanced mobile broadband capabilities through its Rev-A upgrade, which would provide maximum download speeds of 3.1Mbit/sec (average 800kbit/sec) and uplinks of 1.8Mbit/sec. Users needed a data capable mobile phone and a mobile broadband card to access the 027 network. Telecom's New Zealand customers would be among the first in the world to experience the enhancements to the EV-DO mobile broadband technology. Martin Butler, Telecom's general manager of business products, said the roll-out would continue throughout the country during 2007, to cover 70 percent of the population. The $15 million mobile broadband revision undertaken by Alcatel-Lucent was part of Telecom's ongoing investment in mobile data technology and 'would not be the last CDMA upgrade for Telecom.'[19]

Mobile data costs had come down considerably. Vodafone, for example, dropped its rates for 1Gb of data from $149 to $49 early in 2006.[20] It now had monthly data plans ranging from $30–$60 (200Mb–1Gb data cap) while Telecom's casual data for downloading was $8 per Mb; a monthly rate of $10 would reduce that to $1 an Mb, and if you paid $99 a month, you wouldn't get charged again until you hit the 400Mb cap when it was 50 cents an Mb.

Telecom, having invested more than $250 million in its mobile technology over the past three years, shut down its analogue 025 network late in 2007 and migrated most of its customers across to the 027 digital service. It had signed up 100,000 new mobile subscribers in the December 2006 quarter, compared to Vodafone's 89,000 growth. Telecom's 10 percent growth and the new business rival had taken on essentially took mobile penetration in New Zealand to close to 100 percent.

Vodafone chief executive Russell Stanners said his company's 'big hairy audacious goal' was to become New Zealand's top telecommunications company by 2011. He was convinced the future was mobile where the focus would be on bundling in fixed services, but serving up the majority of voice and data to the individual, not the desktop. Vodafone would not succeed if it were to only follow Telecom. The biggest challenge he said was changing people's dependence on the fixed phone.

FIXED-MOBILE INTEGRATION

The breakthrough for Vodafone came from the Commerce Commission's ruling that allowed it access to Telecom's residential and local calling market. From February 2007 Vodafone's two million customers were able to make local calls to Telecom's fixed phone lines and Telecom's fixed-line mobile customers would be able to do the same within set geographical areas.

After its acquisition of Ihug it had wasted no time targeting Telecom customers with a range of plans for unlimited national and overseas calls at a competitive price. It invested $200 million on its

3G digital network, including global roaming and high-speed transmission. Goldman Sachs JB Ware analyst Andrew White believed Vodafone could double its share of the market by 2011 and had the right components: no-cost local interconnection and full number portability from April 2007, which meant Telecom customers could move across without changing their numbers, plus increased network capacity and its ownership of Ihug, which was already eating into Telecom's toll revenues through its competitive toll plans.

Vodafone's Stanners said it was increasingly difficult for his parent group, the largest mobile carrier in the world, to invest in New Zealand because of uncertainty over regulation. Meanwhile the prices it was setting for rivals to access its cell towers was part of the bigger picture being investigated by Commerce Commission, which was looking at why New Zealand had only two mobile phone operators, and the perceived barriers to market entry.

CARRIER TEMPORARILY UNPLUGGED

Towards the end of April 2007 TelstraClear's plans to build a high-tech mobile broadband network were in tatters, as field engineers dismantled the brand new towers it had built in Tauranga and shipped them back to Australia.

After a year of planning, the $50 million Unplugged pilot scheme had been canned after a major rift appeared in the relationship between TelstraClear and Vodafone. TelstraClear CEO Alan Freeth said Vodafone had made a deliberate last-minute change to an agreed deal, while Vodafone CEO Russell Stanners was scratching his head and 'struggling to understand' why the plug had been pulled.

Unplugged was designed to give customers a single handset and a single number for use anywhere in New Zealand, something no other carrier had yet released. The clincher though was the proposed use of a standard local number, which had huge implications for customer phone bills and trumped the new wireless service planned by Vodafone, based around separate home and mobile numbers. Although TelstraClear could do what it liked with its own network in Tauranga, roaming coverage for the rest of country depended on its deal with Vodafone.

While the law required Vodafone to allow roaming, if TelstraClear built a network covering 10 percent of the population, it did not allow this to occur using a local phone number. That was the stumbling block as both companies tried to negotiate the roaming arrangement. While TelstraClear thought it could simply adapt an arrangement signed two years previously, when it had planned a national 3G network, in the end the use of a local number was the deal breaker. Without the free-calling approach, which it was still discussing with Telecom, TelstraClear couldn't make a business case for a network built. It would have bled money for two to three years, something Telstra boss Sol Trujilo would not tolerate. He'd already quashed plans for the nationwide 3G network when the numbers didn't stack up.[21]

Meanwhile TelstraClear was looking to sell down 125 cell site leases as it exited from its plan for nationwide coverage but a complaint to the Commerce Commission put the sale on hold. Freeth thought the sale of the cell sites would be a simple 'highest bidder wins' scenario that would take a matter of days. Wireless provider Woosh and 'other parties' cited alleged

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anti-competitive behaviour in stalling the sales. Woosh it seemed was interested in using the sites to extend its own coverage.

The commission admitted 'several industry participants' had contacted them about the sale citing section 47 of the Commerce Act which enabled it to investigate changes that may result in a substantial lessening of competition in a market.[22] Then two months later it was claimed that Telecom had bought the leases because it basically had 'deeper pockets than anyone else.' That remained a risky deal as the sale could be overturned if the Commerce commission ruled TelstraClear's sale did in fact reduce competition.[23]

Then there was the battle for TelstraClear's existing cellular customer base. There was considerable speculation over what would happen to them once the spectrum sharing agreement signed in 2000 expired in July 2007. Vodafone stated it would take direct control over those customers but TelstraClear said that was 'upsetting and misleading.' It was about to gain access to improved mobile services and told customers, it was business as usual.[24]

TelstraClear was seeking a wholesale deal with Telecom, so its existing customers using the Vodafone network had a real choice of where they went. Telecommunications analyst Darian Bird said signing an agreement with Telecom wouldn't solve the problem as business customers might be hesitant to move onto CDMA and then back to W-CDMA in a year's time, changing handsets and mobile broadband devices each time. Bird said computer purchasing plans would also be affected, as there were already notebooks available with W-CDMA embedded, but not EV-DO.

According to Vodafone's general manager of corporate affairs Tom Chignell, TelstraClear rejected its offer and wanted to extend and then completely renegotiate the agency agreement to coincide with the launch of its wholesale service. However Vodafone was 'not prepared to waste time and expense on such an exercise which would have been for a three-month term.' IDC's Bird warned Vodafone was playing a dangerous game, and risked irking the regulator at a time when the government was looking into the lack of competition in the mobile market.[25]

After all the huffing and puffing the news came in mid-August that Telecom and TelstraClear had signed a commercial agreement, allowing TelstraClear to provide a new nationwide mobile service before the end of the year. That meant TelstraClear could provide its own bundle of mobile services, handsets, and pricing plans without the need to build a new network and still charge voice, data, and mobile on a single bill.[26] Under the agreement, TelstraClear would use Telecom's CDMA network, but not the $300 million high-speed W-CDMA network expected to be completed in late 2008.

While that might have meant a smooth landing for the stranded mobile player the battle to retain existing customers on its expired network deal with Vodafone was far from over. At stake were more than 11,000 business customers with about 40,000 handsets, left hanging after the agency agreement, allowing TelstraClear to resell Vodafone services on an 029 number expired in July. Efforts to revive the deal failed. Customers received mobile services from Vodafone but TelstraClear managed customer services and billing.

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The carriers had conflicting views on who 'owned' the customers.[27]

Then it became clear TelstraClear's deal with Vodafone, forged in the early days of the deregulated marketplace, was never going to be win-win if the two ever parted company. TelstraClear was winning customers in the large enterprise and government space, many directly from Telecom, and needed a mobile offering. It was essentially connecting customers to a TelstraClear–branded service on Vodafone's network and taking an agency commission.

TelstraClear head of wholesale Raymond O'Brien admitted the seven-year-old agreement was 'just one of those things you inherit' and 'one of the worst-written agreements I've ever seen and very onerous on TelstraClear.' According to Vodafone, it had been extending the agency agreement for 12 months at a time, while it waited for TelstraClear to build its own network. According to Freeman Media publisher and writer Matt Freeman, the most recent version of the agreement was set to finish on 30 June 2007. Vodafone got a sniff of TelstraClear's discussions with Telecom and decided to pull the agreement with the minimum three months' notice – all above board, according to the agreement. "O'Brien said Vodafone could have provided 12 months' notice to facilitate a smooth handover of customers. But there was never going to be a handover; these customers were simply coming back to the mothership."

The notice on TelstraClear's web site spelled it out: "TelstraClear will provide these mobile services to you so long as we remain Vodafone's agent. The Agency Agreement we have with Vodafone is scheduled to terminate on 30 June 2007. There will be a transition period but after that, if TelstraClear and Vodafone do not enter into a new arrangement, Vodafone will manage and invoice you for your mobile services." Freeman said the carriers had also been locked in another dispute over unpaid handset subsidy commissions relating to the 18 months, agency agreement, understood to be a large sum of money. However, despite the fallout, large corporate accounts such as MSD, BNZ, and IRD were outside the agreement and jointly managed by TelstraClear and Vodafone.[28]

For the June quarter, Vodafone announced it had added 24,000 customers, boosting its subscriber base to 2.268 million, 168,000 more than the previous year, and further consolidating its position as market leader ahead of Telecom's 1936 million customers. Growth was being driven by 'non-voice services and an increased mix of high value customers.' However, average revenue per customer was slightly down.[29] Telecom had continued to grow its market share over ten consecutive quarters.[30]

After cementing a deal with Nokia Siemens Networks, Vodafone announced its plans to roll out a W-CDMA 900 radio network to increase its coverage, especially in rural areas. The increased coverage, through the opening up of the 900MHz band for 3G technologies, meant this would be cheaper than other technologies, and require only half the base stations of traditional 3G solutions. Nokia Siemens Networks said the technology could provide a two- to four-fold increase in coverage. Commercial delivery of the new W-CDMA 900 nodes began in July 2007 with the service due to go live in the first half of 2008.[31]

Moving up the ranks to become a fully-fledged full-service provider had its obstacles. One of them was the need to have the right kind of billing system in place, to not only keep track of customers but the various services they were using, the suppliers of those services and arrangements with those wholesaling services to third parties. In 2006 Vodafone signed up M2, Compass, TeamTalk, Ihug, and Orcon to become resellers of its wholesale service with a plan for launch by mid-2007. This was stalled by the problems with its IBM-developed on-account billing system, delaying its Mobile Virtual Network Operators (MVNO) project for several months.[32]

CLOSING THE CELLULAR DIVIDE

Telecom was under pressure from both sides of the Tasman as its CDMA network became increasingly orphaned, leaving its customers with fewer roaming options when they travelled overseas. From early 2007 there was speculation that it would move to a hybrid model to compensate for the fact that Telstra had decommissioned its CDMA network in Australia in 2006, leaving Telecom as the sole operator in the region using the technology.

Customers using Telecom's CDMA technology could only get patchy coverage in Europe and in February 2008 its Australian network would be closing. At home Alcatel-Lucent was boosting the capabilities of its CDMA 2000 EV-DO Rev A network, but becoming compliant with the growing population of GSM-based networks, including Vodafone in New Zealand, was a real challenge.

Telecom admitted it was considering a hybrid GSM/EV-DO network. Although its US telco partner Sprint was heading down the Mobile WiMax route, Telecom was unable to follow as it didn't have sufficient continuous frequencies in the same spectrum, and was unlikely to be able to acquire more due to anti-competitive considerations. Advertising agency Saatchi and Saatchi had already pitched Octo, Latin for 'eight,' as the new brand for the roaming service.

IDC's telecommunications analyst Darian Bird said the hybrid approach would be a positive move for Telecom to more effectively integrate its mobile voice and data networks. The lack of roaming was definitely an issue. Announcing GSM plans would also help Telecom to neutralise some of the potential churn after number portability was introduced in April 2007. Joining the larger global GSM standard would also allow Telecom to enjoy a lower price on handsets.

Vodafone had a significant price advantage when sourcing handsets, simply because of the scale offered. Data roaming may have to wait as the cost for both carriers, \$8–\$30 per Mb depending on which overseas network was used, was still too high. Bird said another issue Telecom faced was the future of fixed-mobile convergence, and the fact that dual-mode VoIP (voice over IP) handsets were more likely to operate on GSM.[33]

Forced to make a major decision about global roaming, Telecom secured a deal in April to enable its customers to travel in more than 180 countries. It had been offering Worldmode phones that also operated on GSM networks but that required customers to have two numbers. Now in a deal with Hong Kong mobile operator CSL, only one number and one mailbox would be required;

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customers would get a get a single bill for Worldmode use and much wider global coverage. The three-year agreement, initially for voice and texting, would begin in mid-2007 and extend to mobile data by the end of the year. Smartphones and PDAs with Worldmode capability would be introduced.[34]

Then in May, Telecom announced it would make the long-speculated mobile technology switch, providing the migration path to take customers off the existing CDMA platform, within five years. The new network would be a blend of GSM/EDGE technology operating at 850MHz, providing coverage in rural and urban areas, and wide-band W-CDMA/HSPA[35] at 2100MHz, providing coverage in the cities. While the GSM Edge technology was seen as something of a compromise because it was only second-generation technology, city coverage would be a full 3G service.

Telecom's chief operating officer of technology and enterprises, Mark Ratcliffe, said the 3G option was more expensive as it required more cell sites and would only be extended outward when it was 'economically rational.' New handsets would be able to roam on a national GSM network between the two technologies, 'otherwise we are operating separate networks.' he said. The infill decision had been made largely because the economics for building basic GSM networks had improved remarkably. "The costs of deploying a GSM network are trivial for the position we are in … and will allow us to have a seamless national proposition on day one between UMTS and GSM."[36]

The new $300 million wide-band CDMA high-speed network would be built by existing partner Alcatel-Lucent and give customers greater choice of handsets, real global roaming capabilities, and improved broadband speeds. The network was expected to go live late in 2008.[37] And in July Telecom came up with an improved plan for roaming across five international zones, which represented a 'fundamental change' in how mobile customers paid for global roaming. Customers would not have to worry about off-peak and on-peak rates across 120 or so countries; they'd just need to be aware of which zone they were in.

The $18.4 million revision to Telecom's existing cellular broadband network with Rev A mobile broadband technology upgrade, begun in Auckland in December 2006, had progressed from the main cities and was now extending to areas of high use. It was expected to provide coverage to 70 percent of the more populated areas by the end of 2007.

With both carriers now heading to a point where they could operate over common network territory, another major issue, stifling true competition, looked as though it might be removed from the equation. After all it wasn't really competition if rival players used incompatible technology. In that scenario customers had to swap out their phones to cross the network divide. Presumably with common technology you could keep the same phone and number and just change the prefix. That's certainly something TUANZ was conscious of when it called for fair play in the new environment.

It was hoping the market could avoid the practice of locking handsets to prevent customers 'SIM-switching' on their phones. Chief executive Ernie Newman said the first-time users would

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be able to keep their handset when switching networks, but he didn't want to see barriers or impediments put in place. "This is dependent on both companies refraining from locking the handsets at the time of sale to preclude use on other networks. Telecom is already on record expressing concern that Vodafone will do this to deter customers from switching to Telecom."

A healthy number of customers changing between mobile operators leads to more dynamism in the market and more price competition. "In New Zealand there have been several barriers to customers wanting to switch, so as these barriers are removed it is important that the benefits are not reduced by anti-competitive actions," said Newman.[38]

In mid-July 2007 Vodafone began offering its first complete phone and broadband package, claiming this would save up to 60 percent on calls to its own cellphones and on toll calls; those signing up to a landline for 12 months would also save 20 percent on line rental. It had lowered its home-to-mobile price to 39 cents a minute, compared with Telecom's rate of 71 cents. The offer to business customers was expected to translate to home users and trigger a competitive response from Telecom.[39]

British-owned Vodafone had about 55 percent of the mobile market but only 30–40 percent of those were business customers. David Kennedy, research director at telecommunications consulting company Ovum, said the bundled deal reflected a global trend to protect the existing customer base and generate new revenues in developed markets where mobile connection growth had slowed. "I'm not expecting a dramatic shift because in a way Vodafone has stepped up to the mark that Telecom has already set. Had Vodafone not done that, then you might have seen some quite dramatic changes in the market."

While mobile services would be delivered over Vodafone's network, all fixed-line services were provided under a wholesale deal with Telecom. IDC's Darian Bird said phone companies wanting to survive over the next few years needed to become one-stop telco shops. "A few ISPs will be able to offer mobile and fixed bundles, but Vodafone as the network owner will have more control over pricing and products."[40]

MOBILE MONITORED

The government insisted mobile market competitiveness was an essential piece of the broadband jigsaw and the Commerce Commission was immersed in a full-scale investigation into mobile roaming and co-location. Mobile prices, which the OECD claimed were the highest or second-highest among its 30 members for some categories, were not acceptable, said Communications Minister David Cunliffe in June. A government decision to investigate mobile termination rates had already resulted in rapid decreases in the price to consumers.

Cunliffe said mobile issues would become increasingly important with the potential entry of a third mobile player. The government was watching closely to ensure existing players did not engage in access-denying behaviour, with investments by both existing players likely to bring 3G mobile broadband within reach of most mobile customers over time. Cross-investments such as Vodafone's purchase of Ihug and Kordia's purchase of Orcon implied more complex competitive dynamics and some consolidation ahead.[41]

ECONET STILL REVERBERATING

Econet Wireless, which had mobile networks in Africa, signed an agreement with Chinese equipment supplier Huawei Technologies to pilot a W-CDMA network in Auckland back in December 2005, but lost credibility when successive plans failed to materialise.

The spectrum for the company's proposed nationwide network came through a joint venture with Hautaki Trust in 2000, and intended to use frequencies gained as part of Treaty of Waitangi claims to radio spectrum. The pilot involving ten Auckland sites and a switch, was due to have been completed by April 2006. Econet had registered the 0281 prefix and expected its network, using similar technology to Vodafone, would quickly expand to 410 sites in four cities at a cost of around $120 million.[42]

That plan was stalled when the company had difficulty finding investors and was further derailed as the technology it planned to use was superceded. However it blamed the regulatory environment saying it still needed clarity to make the business case to move forward.

Six months later Econet project manager Tex Edwards said he was delighted to hear the Commerce Commission would review the mobile market. A problem, however, was that Vodafone had control over the entire 900MHz spectrum in New Zealand. This technology could cover a wider area than the 1800MHz spectrum available to Econet, and require fewer cellphone towers to get into rural areas. Without access to those frequencies, said Edwards, Econet was priced out of providing national coverage and there was no business case. Until the regulatory environment was fixed there was no point in pouring money into building a network. As Tim Hunter said in the *Sunday Star Times* in May 2006:

Econet a joint venture between an African mobile phone operator and Maori interests, has been all mouth and no trousers for years – it is scarcely any nearer to building a network that it was five years ago. Its parent company Econet Wireless is in no shape to invest tens, possible hundreds of millions in New Zealand. A London stock exchange listing looks in doubt. Econet wants to locate its equipment on existing cell sites but says Vodafone stalls at every turn; Vodafone says Econet's demands are simplistic and unrealistic.[43]

In the meantime $36 million of Huawei equipment for the proposed ten-site mini network began arriving from China with claims it would be up and running by August. There was no sign of a network in August but Econet had announced a $100 million capital infusion through a memorandum of understanding with Hong Kong and UK-based Communications Venture Partners. "We were anticipating a far speedier outcome from the Commerce Commission's review of mobile services," said Edwards, who then admitted plans for an Econet pilot network in Albany had been postponed. Delays caused by the addition of new investors had prompted a restructuring of the overall Econet build programme. He anticipated increased investment would now lead to an expanded 400- to 800-site network "should normal competition rules be adopted by the Commerce Commission."[44]

In March 2007 Econet was still claiming regulatory concessions were needed to make the market work in its favour when it came up against

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Vodafone and Telecom. The imminent number portability agreement, enabling customers to move between carriers and keep the same number, was an important step as was government pressure on the existing players for better fixed-line-to-mobile termination pricing. An affordable deal to use Vodafone's network would also help. Econet, he said, would focus on delivering affordable calling plans on low-cost handsets. The company was now talking about mobile TV, location-based services, music downloads, and video telephony but no one would comment on the postponed trials or specific details on its network roll-out. Former chief executive Tex Edwards had apparently been asked to step aside to make way for someone with more operational experience.[45]

In its submission to the Commerce Commission on roaming and co-location, Econet Wireless pointed out the need to create a 'fertile ground' for competition. It said regulatory pressure and change was needed to encourage the entry of a third or even fourth network operator. "Without regulation New Zealand will continue to be the only country in the OECD with just two operators and no same-technology competition." Econet claimed roaming and co-location were not the only downstream abuses of significant market power. "Issues such as spectrum (including Vodafone's monopoly of the 900 MHz spectrum), pocket and on-net pricing, and RMA restrictions, are highly material."

Econet said the key issue was the price at which roaming and co-location were made available. "Setting the designated service pricing too high will mean that a third network will not be implemented or may expose the third operator to a price squeeze on all or some of the offered services, denying end-users any long-term benefit."[46]

The cellular company was now operating under the name NZ Communications, originally formed in 2001 as the original commercial partnership between Hautaki Trust and Econet Wireless. It was increasingly taking a back seat, downgrading its shareholding to only 10 percent, while Maori investors increased their stake back-up to 20 percent. Bill Osborne, company chairman and a director of the pan-Maori Hautaki Trust, gained approval in July to increase its stake after it had been diluted through the injection of conditional funding from Hong Kong investors, who now owned 65 percent of the company. A share option was made to 'specific, sophisticated Maori investor groups,' who were prepared to put a million dollars into the company, said Osborne.

"It's been a long haul, but it was in neither of the incumbents' interests to have any change take effect and they're very big and influential corporates in New Zealand," said Osborne, who was hopeful its cellular network would be operational by the second half of 2008. NZ Communications had bought an office building on Khyber Pass in Auckland worth $4.8 million and was awaiting council building consent to install network switching equipment.[47] It had also signed a national roaming agreement with Vodafone, which could mean a much quicker roll-out than having to build its own network. There were also rumours it might be looking at a deal to launch the global Virgin Mobile brand in New Zealand.

Computerworld Australia reported Virgin Mobile had completed an infrastructure upgrade across the

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Tasman and in New Zealand to support 'aggressive growth plans for its 3G network' in both countries. However neither Virgin Mobile nor NZ Communications would comment. Tom Chignell, Vodafone's general manager of corporate affairs, confirmed the national roaming deal with NZ Communications and the fact that the company had purchased some 900MHz spectrum from Vodafone, at 'a fair market price not inconsistent with what is usually paid for such blocks.'[48]

However in September NZ Communications was still looking for 'an accommodating commercial environment through regulation or the threat of regulation,' claiming its $100 million conditional funding was at risk. Despite a co-location arrangement to place its equipment on Telecom cell towers and negotiations for a roaming agreement with Vodafone, nothing had so far resulted. In its submission to the Commerce Commission on plans to regulate the mobile market it suggested apparent concessions by existing carriers were little more than token gestures 'to avoid regulation.' The company claimed its 'substantial capital investment' was at risk under the current regulatory environment and likely to be redirected to incumbent operators if something wasn't done soon. It still, however, expected to enter the mobile market in the second half of 2008.[49]

Another 2008 entrant would be Orcon, which had pushed back the launch of its Vodafone-rebranded mobile phone until early in 2008, but promised it would be 'well worth the wait' with a range of previously unseen services. Customers would be able to set their landline and mobile to ring at the same time and retrieve voicemail left on mobiles and landlines from a single voicemail box. Orcon was actively working on DVB-H, a broadcast technology already trialled by Kordia that would let customers use their mobiles as fully functioning mini-TV sets that could pick up Freeview free-to-air broadcasts.[50]

"The New Zealand mobile market is reasonably unique with a high level of maturity and above 100 percent penetration, yet only two operators present. As a result, a large proportion of the 12 percent subscriber growth over the last year stemmed from consumers with both Vodafone and Telecom accounts. Some of the more developed countries around the world are already above 110 percent penetration, so we'd expect the mobile market in New Zealand to keep growing," said IDC telecommunications analyst, Darian Bird.

There were at least 4.25 million mobile subscribers in New Zealand at the end of 2007. In December 2007 NZ Communications entered into an agreement with Telecom to acquire 5MHz of paired cellular radio spectrum suitable for a wide range of cellular technologies and also signed a roaming agreement ensuring that its proposed network could hand off to the Vodafone network in areas where it didn't have coverage. An imminent shake-up and a price war was expected in 2008 with the long-promised arrival of NZ Communications as a discount provider, Orcon reselling Vodafone and Kordia access promised surprises, and TelstraClear would ramp up its reselling arrangement of Telecom's services.

TUANZ boss Ernie Newman said a decision by the Australian telecommunications regulator to cut mobile termination charges to nine cents per minute showed New Zealanders were getting a bad deal. In April the New Zealand government accepted voluntary offers from Telecom and Vodafone to gradually reduce fixed-line-to-mobile termination rates, but the Australian move showed up the disparity between New Zealand and international rates.

Telecom had offered to reduce its mobile termination rate from 20 cents a minute to 12 cents a minute, and Vodafone said it would drop the rate from 20 cents a minute to 14 cents, over the next five years. In Australia, the regulator had declined similar offers from mobile companies, saying the terms and conditions were unreasonable. "Termination rates are a major component of retail fixed-to-mobile calls and a reason we are paying silly prices such as 71 cents a minute for a call from home to a cellphone."

Newman said Minister for Economic Development Trevor Mallard obviously did not understand, in eliciting the undertaking from the local carriers, that mobile termination rates were "falling like a stone" around the world. As a consequence he had "locked us in for five years at the world's highest prices." He said the government should cancel its deal with both companies and hand the issue back to the Commerce Commission to consider. In 2005 the commission recommended mobile termination rates should be regulated, saying it would lead to cheaper cellphone calls. When asked by the government to reconsider its decision, it again recommended regulation. In the report released in May 2006, the commission did not specify a termination rate but said regulation could save phone customers between $46 million and $63 million over five years.[51]

When the commission's draft recommendation on roaming and co-location services was released in August 2007 there was a sigh of relief from mobile junkies who were hoping to see the cost of calling trend down more quickly than it had been. It may also have provided the incentive for other players to enter the market. The commission recommended national roaming and co-location should be subject to price regulation as designated services. It recommended the Telecommunications Carriers' Forum make changes to the co-location code "to provide a dispute resolution mechanism for replacement costs, as well as apportioning the costs of co-location based on space utilisation."

Telecommunications Commissioner Dr Ross Patterson. Photo: Trevor Coppock, The Independent

Telecommunications Commissioner Dr Ross Patterson said the proposed changes should improve the chances of entry for a third mobile player. "New Zealand and Slovakia are the only OECD countries which do not have three or more mobile operators ... The recommendation . . . is likely to facilitate new entry, which will lead to more competition, greater choice of provider, lower prices and more innovative products and services." The Commission said it had assessed Vodafone's undertaking as an alternative to regulation but felt that in its current form it was "not likely to promote entry into the New Zealand mobile market."

Ernie Newman urged the commission to act with haste on producing a final version and "avoid any diversions that might delay its process." The government should not treat the recommendations as "an opportunity to invite the phone companies up to the Beehive to re-litigate." Vodafone was 'surprised' by elements in the draft report and would seek clarity on a number of points. It was concerned at the move to allow Telecom access to the national roaming service on Vodafone's network.[52]

That news may have only served to make Vodafone more aggressive in its stated goal to become number one in the market.

It launched a 12-month free basic broadband deal in mid-August for customers who signed up for a 12-month contract for home phone, talk2, and other plans. Qualifying customers would get a monthly credit of $30 for 12 months against their access charges for core Ihug broadband plans.[53] Vodafone had essentially stepped out the rest of the market with its actions. The result was a price war at ISP level to try to stem the churn across to the mobile carrier, which had obviously taken lessons from its nemesis in its attempts to win and retain new business.

Then OECD figures again confirmed New Zealand was struggling to keep pace with its international peers. Phone calls in New Zealand were still among the costliest in the OECD, with only one of the fixed and mobile plans surveyed rating in the top half of the 30 countries. Statistics released by the Commerce Commission covering the June 2007 quarter showed very little change in the price of mobile packages. With telecommunications prices falling around the world, New Zealand slipped down the rankings, sitting firmly in the bottom quarter.

While Vodafone's plans ranked better than Telecom's in the comparisons, the Commerce Commission criticised the 'extraordinary number of restrictive conditions' of its best ranking plans. The plans that Vodafone described as 'bare bones value' had long contract terms, heavy contract termination penalties, and no handset subsidies or international roaming. Telecom mobile packages languished at the bottom of the table with its Go Prepaid Mates Rates plan costing nearly double the OECD average, as one of the worst performers for occasional mobile users. When the commission compared Telecom's home-line deals with those offered by TelstraClear, Telecom's rival came out on top, even when it was reselling Telecom services.[54]

SPEED LIMIT EXCEEDED

And just as the local market was heating up on the international front there was news of a technological breakthrough that would ultimately pitch mobile data services against anything the copper landline or existing cellular carriers could serve up. Revolutionary advances in wide-band CDMA revealed by Nokia Siemens Networks indicated mobile phones would soon be able to download feature-length movies within minutes. The technology, positioned for commercial release in five years, would see download speeds of more than 100Mbit/sec and had already been demonstrated at Germany's Fraunhofer Institute for Telecommunications (Heinrich Hertz Institute).

A lab test showed a Virtual MIMO (virtual multiple input multiple output) uplink using the SDMA (space division multiple access) technique, to communicate with a base station simultaneously on the same radio channel, produced an aggregated uplink speed of 108Mbit/sec. Virtual MIMO required only one power amplifier and transmission antenna for each device, reducing production costs and power needs. According to Nokia Siemens New Zealand account manager Mike Smathers, mobile download speeds were currently around 3.6Mbit/sec. "That will jump to five, ten and then 20Mbit/sec in the next year or so but we won't see 100Mbit/sec for at least five years. This is all part of the roadmap for wide-band CDMA," he said.[55]

Of course everything comes at a cost, especially with the current 'user pays, per megabyte' approach of carriers keen to clip the ticket every time you pass go. It was enough to cope with the cost of existing bandwidth charges let alone what a 100Mbit/sec service might cost, as Kiwi blogger Cameron Slater discovered when he visited Australia for three weeks.

He was astounded when his bill for data use came through for $7230 or $328 a day. The Auckland businessman cried 'extortion' and demanded the Commerce Commission investigate roaming fees. Slater, known by his on-line name 'Whale Oil,' had been on a standard Vodafone 1Gb a month package. On his June 2007 road trip, he used his laptop and Vodem to surf the Internet and compile his blog for less than two hours a day. His records showed 218Mb of data was used

roaming on the Vodafone Australia network, charged at one cent a kilobyte. On other networks, 165Mb of data was used, charged at three cents a kilobyte. Slater complained to Vodafone NZ, saying the data bill was more than the cost of his petrol, accommodation, and car rental for the entire trip. A Vodafone customer in Australia would have paid $50.95 for the same data usage and a Telstra customer just $24.89.

"I fail to see how an electron sent from my laptop is any different from an electron sent from an Australian laptop in Australia ... These charges are immoral, unconscionable and utterly unjustified by any measure you care to choose," he said in his email to Vodafone, disclosed to industry weekly *Computerworld*. Vodafone's local customer support replied GlobalRoaming was 'a premium service' attracting premium rates from other telcos and consequently domestic limits don't apply. Spokesman Paul Brislen said such charges were standard around the world and reflected what the Australian telcos, for example, charged Vodafone NZ.[56]

Despite all the announcements and grand plans there was still a long way to go before New Zealand got a third carrier, before existing carriers achieved cross-network compatibility, delivered more affordable roaming arrangements and launched their next generation broadband cellular networks. A number of key factors remained uncertain, including what companies would do with the newly acquired spectrum from the government and the impact of legislative changes on existing and intending players.

Ahead of the government's decision to regulate the mobile market there was an air of uncertainty. The legislation would open up the way for mobile roaming by requiring competing carriers to have access to each other's networks at regulated prices. Vodafone said the proposals would have a serious negative impact on the business case for its planned network build. It had already built a new 3G network capable of providing high-speed mobile broadband to 60 percent of New Zealand's population, but further plans were on hold until it had clarity about the way ahead.

The Commerce Commission had proposed market entrants be able to access new network technologies, including 3G, wi-fi, and WiMax, in addition to the existing 2G networks. "The commission is seriously misjudging the real effect on investment of requiring us to make 3G and all other new technologies available to roaming competitors immediately," warned Vodafone general manager of corporate affairs, Tom Chignell. Meanwhile, both TelstraClear and CallPlus told the Commerce Commission they were having difficulties nailing down commercial agreements with Vodafone, and regulatory changes were imperative.[57]

Both networks had moved into music downloads and even movie downloads, chasing the international trend. While screen size and processing power limited what was possible, more powerful phones continued to lift customer expectations. While the market had reached saturation point for phone penetration there was always the next generation of services and handheld devices to keep driving things forward.

Regardless of whether a third independent mobile carrier entered the market, there would be more options for consumers than ever before as TelstraClear and Orcon explored ways to add value to rebrand Telecom and Vodafone services and the government put the squeeze on to bring prices down. There would not only be differentiation in network offerings but a continual evolution in the design, branding, and capabilities of the different devices that interfaced with the mobile networks.

Apple's much hyped iPhone was on the horizon, computer maker Hewlett-Packard had entered the fray with new phones that converged the capabilities of its iPAQ handheld computer, and a range of devices more focused on services than loyalty to a particular carrier were shifting the market. Even Google was building its own mobile device.

There was no doubt the mobile phone would become an integral part of the wider wireless network, handing off between the home, public networks, hot spots in cafes, and the work environment. However the value of new, expensive, handheld hybrid devices, and the networks that supported them would be dependent on quality of service, guaranteed access, and consistent speed and tariffs that didn't have users sweating about download charges or the cost of pay-per-use services.

The future, it seemed, would have a lot to do with bundling, as the mobile phone networks sought to win business from the fixed-line carriers; for example Vodafone, Orcon, and TelstraClear offering cheap broadband alongside home line and cellular connectivity. With cheaper cellphone calling rates, the huge chasm between free local calling on fixed-line phones would start to dissipate. But Telecom's interim plan was to offer packages of tolls, on-hold, answer phone, caller ID, mobile handoff to home or office and broadband to keep us linked into the copper.

The future of cellular was glimpsed by the huge interest shown when Sky TV delivered eight channels of TV to Vodafone's 3G mobile customers and state-owned Kordia began trialling technology that let mobile phones act as fully functioning mini-TV sets. An unknown factor was the wireless market and whether new hybrid phones would enable seamless handoff between regional and local hot spots.

All eyes were on the new contenders, impending regulatory changes, and what new services, handsets, and price points might be offered – particularly for data transmission – as true cellular competition finally took shape. Regardless, it was no longer a wrangle over who had the most cellular customers, but who could attract and retain customers for services right across the $6 billion telecommunications market.

WIRELESS HOME AND AWAY

The ability to escape from the office or home to a local cafe without losing your connection to the Internet or your electronic link with friends or business associates was proving an attractive option as New Zealanders discovered wireless or wi-fi.

Wi-fi, started as a quiet revolution from around 2002 as people began setting up their own home or small office networks with a wireless hub distributing their fast Internet connection to laptops and other devices at speeds of around 6Mbit/sec. Connections soon stabilised at 10Mbit/sec. With each new generation the stability and speed got better and public hot spots began appearing in cafes, petrol stations, hotel lounges, and at airports for people to connect to the Internet.

Wi-fi is mainly centred around the 802.11 standard using the unlicensed 2.4GHz band to transmit data across the radio spectrum that's normally occupied by cordless phones, garage door openers, and Bluetooth products designed for device connectivity. A transmitting antenna, usually linked to a DSL or high-speed land-based Internet connection, uses radio waves to beam signals to PCs, laptops, PDAs, and mobile devices. A client antenna, a PC card, or chip embedded into the remote device picks up the signal, typically within a 100-metre range of the transmitter. The further from the signal, the slower the data rate although additional transmitters can boost speed.

Within a short time wi-fi had become the obvious alternative to buying a couple of hundred metres of Ethernet cable to share data with computers in different rooms. With

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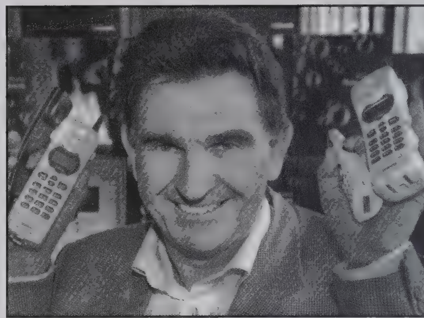
an Ethernet Bridge and digital TV receiver, you could hook up wirelessly to TV or stereo as part of the home entertainment centre. You might have a PC and a DVD player connected to a network sharing music, data, and movie files to any room of the house. In the future the wireless network would be pervasive, between homes, public hot spots, and offices as well controlling air conditioning or garage doors, making phone calls or controlling TVs.

The business case for the wireless LAN had stumbled along for almost a decade, suffering from distance and throughput constraints, standards uncertainty and management and security issues. It went through a pre-boom period in 2000 but a general downturn in the market and serious security flaws put the dampeners on.

From the end of 2004 security was pretty much sorted, and while management issues now topped the list of business concerns, there was a greater willingness to adopt wireless as a mainstream adjunct to the wired network. After a 2005 survey IDC said wireless LANs were expected to grow 33 percent a year for the next five years. And while sales of fat or stand-alone access points peaked in 2004 and were expected to decline slightly, controller-based access points for centrally managed wireless networks were expected to grow more than than 33 percent a year.

HOT SPOT ROAMING

Wireless networking was becoming harder to ignore as workers unleashed to roam around the premises or the nation with full network access, delivered measurable productivity gains. Wireless was perfect for hospitals, universities, hotels, and premises where management



Bob Smith, CEO of Woosh until August 2006

and project teams needed to move around. If there was a wireless node in the boardroom, classroom, laboratory, or lobby there was no reason anyone would have to race back to their desk for important documentation.

Around the world, travellers, business people, and individuals were making use of hot spots in airport waiting areas and lounges, cafes, bars, conference centres, libraries, universities, and public locations. According to IDC there were approximately 20,000 hot spots worldwide in 2003, and this was expected to grow six-fold by 2005. About 42 percent of all notebook computers were wireless-enabled and by 2006 it was a standard function.[58]

Several technologies were competing for mainstream coverage of cities, towns, and indeed the nation as logical alternatives to last mile wired infrastructure, delivering fast Internet access directly to customers in fixed or mobile environments.

While unlicensed spectrum was suitable for the home there was a rush to gather up appropriate spectrum to roll out highly secure, faster performing wireless networks. Telecom was a big player in that market and keen to expand its coverage, as were alternative carriers

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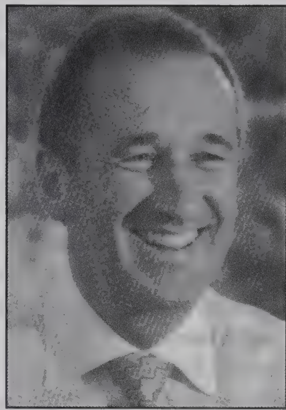
CallPlus, Woosh which was building in Hamilton and other locations, FX Networks and Kordia.

Auckland City Council was planning to deliver wireless Internet access in the CBD and fringes as part of a drive to deliver more affordable broadband for most Auckland residents by 2010. The council was planning an open access, outdoor wi-fi network as part of its 'CBD into the future' strategy.[59] The council hoped tourists, students, business people, and travellers would be able to fire up their laptops in public spaces in downtown Auckland, to gain quick access to the Internet. "It is envisaged that any private service provider on the network would charge consumers for use, but access to select Auckland City Council web sites will be free."[60]

FX Networks was in the process of establishing a wireless mesh network as the last mile connection to homes in Wellington's Oriental Bay. Chief financial officer Derek Locke was looking at ways of avoiding Telecom's copper network entirely. Its trial with two wireless partners, Digital Air and Araneo, would enable it to deliver 5-10Mbit/sec over a radius of six-ten kilometres. "If you laser it down [to a narrow beam] it can go up to 70 kilometres." This meant smaller centres like Masterton and Carterton, already within reach of FX's fibre backbone, would be easy to cover.

WIRELESS WORLD WIDENS

In May, David Cunliffe announced a mega-auction of broadband wireless spectrum in the 2.3GHz and 2.5GHz bands, expected to deliver at least six nationwide blocks of spectrum plus a large 'managed park' to accommodate regional and iwi interests. This was expected to fast-track roll-out of WiMax and other broadband wireless



Geoff Hunt, chief executive of state-owned Kordia (formely BCL) which acquired ISP Orcon in mid-2007.

applications. Strict acquisition limits and use-it-or-lose-it provisions would apply to prevent anti-competitive acquisitions and spectrum hoarding.[62]

Meanwhile WorldxChange and BayCity Communications announced plans to offer customers outside metropolitan areas the option to go wireless for phone services in addition to existing wireless broadband offerings. WorldxChange first offered wireless voice calling with VoIP technology in July, using Kordia's radio transmission network. Chief executive Cecil Alexander said customers would get all the regular phone services such as free local calling, voicemail and call waiting. The service was delivered 'line-of-sight' up to 50km from Kordia's network of broadcast towers to 600,000 potential residential and business customers.[63]

BayCity Communications in Timaru also planned a voice service for rural customers using satellite transmission and Kordia's network to provide broadband to those not able to access high-speed Internet from Telecom. The

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company had signed a 12-year, $100 million deal in April with satellite-owner IPstar so it could deliver phone and Internet to between 40,000 and 60,000 customers.[63]

Meanwhile Vodafone was claiming it could already reach 70 percent of Telecom's so-called 'non-viable' Telecom customers through its network. About 68,000 customers fell into the 'non-viable' group and were subsidised across the industry. The announcement of Vodafone's new fixed-line consumer offering, bundling line rental, tolls, and broadband for about $60 a month, was the start of a new era for the mobile phone company as a full service provider. Its acquisition of Ihug had given it the ability to offer broadband Internet and related services, and win new business by offering 12 months' free broadband and access to Telecom's network including line access. Blogger and publisher Matt Freeman suggested this might be the end of the Ihug brand, which was appearing less and less in the market.[64]

Hastings-based broadband provider Swiftnet won two blocks of 3.5GHz spectrum and took delivery of its WiMax infrastructure in September. Swiftnet, formed by Bizness Connect, chose Alvarion equipment to supply business and residential broadband services and would use Kordia's backbone network. It would erect base stations in Hastings and Masterton areas and go through a testing period before a wider launch. Company director Ray Sciascia said the network was being built to "address the lack of access to quality, affordable broadband to rural and under-served communities." Its licences covered Hastings, central Hawke's Bay, Masterton, and Tararua.[65]

Wairarapa-based ISP WIZwireless also believed the answer for last mile infrastructure for rural areas was to go wireless. The company which launched in 2002, purchasing Masterton-based ISP WISEnet's customer base and equipment from Orcon early in 2007, planned a local roll-out which it would expand to other parts of the country if it could get financial backing. WIZwireless had 27 active access points covering 20,000 square kilometres in the general Wairarapa region.

Director Bridget Canning said the company might be a small ISP but it took a large bite out of the area it covered. With the biggest hop point being 40km, she claimed it serviced the largest area to be covered by wireless technology in New Zealand. The company used Trango and Fox equipment and offered speeds up to 5Mbit/sec using 5.8GHz and 2.4GHz spectrum. Canning said wireless technology was 'absolutely fundamental' for rural areas and while it might be costly to install she was hoping for some relief, including re-channelled investment through the Kiwi Share review. She estimated it would cost around $50 million to get true nationwide broadband to under-served areas; less than Telecom was receiving under the Kiwi Share service obligations. Satellite, the main competitor for coverage of outlying areas, was not all that it was made out to be, costing more than wireless.[66]

KORDIA CUTS LOOSE

Orcon was continuing to up the ante with its technology and in January acquired a $2 million next generation suite of products including a voice switch from Siemens. The soft-switch, together with other products in the suite, would include voice VoIP, IPTV, fixed-mobile convergence, and unified messaging which enabled phone, mobile, and email to work together.[67]

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In June 2007 Orcon founder Seeby Woodhouse announced the sale of his ISP and telecommunications group to state-owned enterprise Kordia for $24.3 million. Woodhouse owned 80 percent of the company and would pocket $19.44 million from the deal. The other 20 percent was owned by Orcon's chief technology officer, Mark Mackay.

Woodhouse said he turned down about 50 offers for Orcon over the years. However he realised that if the company was to tackle the opportunities from opening up Telecom's fixed-line network and the convergence of telecommunications and media technologies, it would need greater resources. Talks had begun with Kordia about October 2006, shortly after it missed out on bidding for Ihug. Woodhouse planned to stay on as a consultant for two years. General manager Scott Bartlett replaced him as Orcon's chief executive.

Kordia chief executive Geoff Hunt said the profitable Orcon would be run independently. "We're going to start where Telecom is trying to get to. We're going to start structurally separated and continue structurally separated." Orcon, based on Auckland's North Shore, had 95 staff and about 75,000 customers, making it New Zealand's fourth biggest ISP. Kordia's existing broadband service had 2000 customers in rural regions but had the capacity for 20,000. Orcon's retail presence could help fulfil this potential, said Hunt. Kordia and Orcon combined had a strong platform on which to develop Internet protocol television, video-on-demand services, and mobile phone content. Orcon was launching mobile phone services through a wholesale deal with Vodafone in October.[68] Kordia was also in rapid roll-out mode using its wireless technology to enable a range of players including WorldxChange to extend their capabilities into outlying areas.

Meanwhile, in its first foray into the consumer market, Kordia completed a wi-fi build in Taupo ready for interested third parties including ISPs to roll out services using kit from wireless company RoamAD running on top of its own extensive nationwide network. Kordia was also developing wi-fi infrastructure in Auckland and had plans to expand to nearly 20 locations including Whangarei, Dunedin, Wellington, Hamilton, Rotorua, Invercargill, and Queenstown. "We're not talking about hot spots anymore; we're talking about hot zones," the company said. It was also looking to improve its Extend rural wireless service and looking at WiMax options.[69]

While local loop unbundling was the big opportunity for growth, CallPlus was still hedging its bets with wireless technology. Executive chairman Malcolm Dick remained sceptical about LLU, having watched events unfold around the world. "Overseas experience has shown it doesn't really get going for five or six years." His focus largely remained on making the most of WiMax wireless technology to broaden its reach. CallPlus was the third largest carrier after Telecom and TelstraClear but still could claim only 0.7 percent of the total telecommunication market. It was generating $80 million annually, employing close to 200 people and had grown 30 percent in the 2006–2007 year.[70]

The company had achieved its own structural separation, regrouping into four business units to better position itself for the challenges ahead. CallPlus retail, Slingshot retail, Blue Reach, and Wholesale and Regulatory would use shared services for core

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technology, finance, human resources, and administration. Dick said services and improvement in technologies were often stifled by Telecom's grip on its competitors and CallPlus's customers had felt the brunt of this challenging environment for too long. "Our reorganisation is essential and will ensure we are well-positioned to aggressively go after Telecom's market share and advance our network build, customer acquisition, and product delivery."[71]

The company was determined to develop a WiMax wireless phone and broadband Internet network across the country. It dismissed claims its $574 million funding line from a Japanese investment bank had been severed, undermining its ambitious plans. CallPlus group chief executive Martin Wylie, however, admitted the project had been delayed pending the outcome of the government radio spectrum auction scheduled for December. CallPlus has a $3 million WiMax network operating in Whangarei, which Wylie said had shown the technology was suitable for a wider roll-out. The company would be re-evaluating the technology based on an evolution in standards. It now favoured a newer standard which incorporated mobile devices and was better suited to phone calls.[72]

20

Digital refresh required

Government learns to share

> Technological innovation is transforming our world and New Zealanders expect government to interact with them in new ways. This means using network technologies that people are familiar with in other parts of their lives: social networking web sites and tools like blogs, wikis, and folksonomies; the full range of digital channels such as mobile phones, instant messaging, podcasts and digital TV, as well as Internet pathways.
> The eGovernment Strategy, 2006[1]

The goalposts were shifting with the quickening pace of technology. Laws that barely coped with the early days of the technology revolution, the regulatory environment, the definition of broadband, and what was meant by e-government had all been stretched and were perishing like old rubber in the sun.

The government's multi-billion dollar efforts to prepare for the onslaught of change across all areas of society had only gone part way to gearing for what was ahead. We hadn't completed the old infrastructure, and the requirements for the new one were already being scoped out. We hadn't trained enough skilled people to work in computer science, engineering, and ICT yet our skilled teachers and tutors were leaving en masse.

There was a sense of urgency as the country was being left behind its peers in the OECD club. A major thrust was under way for greater collaboration between the public and private sector, along with efforts to bring e-governance and ICT-related projects into more flexible digital frameworks that could be refreshed until the recipe was right. At last it seemed all the research, reports, industry white papers, and hard lessons from a decade of experimentation would amount to something, as the government repackaged them into a 21st century vision statement.

Communications Minister David Cunliffe described the government's Digital Strategy documents, first released for discussion in October 2004, as the most significant shift in direction for ICT policy since Labour took office in 1999. He envisioned it leading to improved technology skills, higher Internet speeds, a stronger focus on content development, and on-line learning and business resources. Our industries, he said, would take world-class ideas to the international

arena, our researchers would keep abreast of the latest international developments in science, medicine, and agriculture, and our children would share virtual global classrooms.[2]

Cunliffe believed he could turn New Zealand into a world-class innovator with a place in the top half of the OECD through our use of ICT, which had the potential to create value, attract new investment, grow key industries, preserve our cultural capital, and enable our communities to prosper. Content, connection, and confidence were the three enablers for this Digital Strategy. Connection would provide the means, the right skills, and a secure on-line environment would deliver confidence and a compelling reason to access and deliver content and make it happen. Government, business, and communities were seen as the agents of change with their respective initiatives impacting on each other.

STOKING THE ICT MACHINE

In 2004 our combined information technology and telecommunications sector was a 50/50 mix worth about $11 billion a year – depending on who you talked to – making up around 5 percent of New Zealand's GDP. Then there was the software industry with annual revenues of about $488 million and electronics, which was a multi-billion-dollar earner exporting about 75 percent of production. Who knew what engineering, e-commerce development and related service, support and consulting industries were bringing in? Then of course there were scientific and biotech breakthroughs and creative industries including film, radio and television, multimedia, and interactive games, all of which had high return for local investment.

As part of the big plan, government wanted to see ICT revenues double by 2010 to 10 percent of GDP or around $20 billion, in line with its 2003 ICT Taskforce recommendations. "It's a big ask – we need to have a lot of things in place before we can achieve this," said Jim O'Neill, executive director of ITANZ. "We have to have an industry growing at 5–10 percent a year and that can only be achieved by growing the capability of IT organisations, driving up the productivity of users and looking at infrastructure." Overseas companies needed greater incentive to invest here, and business tax issues including the way research and development was treated were impeding the growth process. For example he said the state sector, which made up 50 percent of the total IT spend, typically opted for 'the safe edge' rather than the cutting edge. "Because government is in a dominant position it should accept the responsibility for growing the sector."

O'Neill said health and education were perfect examples of where ICT could make a massive difference. "Some in the health industry think having 14 health boards doing their own thing is not so bad but others believe a small country like New Zealand can't afford to have independent health systems that aren't talking to each other." There are now ways to get around varying health standards and delivery. Similarly through more widely deployed broadband, it was becoming possible to deliver a 'fantastic curriculum' right across the country. "If we use technology properly, rural communities can attract the same kind of teaching skills as Auckland Grammar."

ITANZ wanted to see the government grow intellectual property from state-of-the-art government developments. Land Information New Zealand (LINZ) had digitised the property sector with a world-beating solution and the National Health Index of patients was another leading-edge local development that could be exported. We needed to leverage 'off-the-edge solutions' that addressed similar problems faced by other countries. "Because we don't always have the resources we're forced to look at problems differently. However we seem to be satisfied with having a great idea and selling five systems locally rather than turning this into intellectual property we can retain and continue to get benefit from," said O'Neill.[3]

SHARING AN UMBRELLA

The government's goal of doubling ICT revenues had stirred up deep feeling across the industry. What was government doing placing such high thresholds on an industry it had done little to foster in the past? How would such targets be achieved when the country hadn't been training people with the right skills or providing R&D tax and other incentives to attract finance or grow businesses? And one of the questions that had been sidelined so many times was being asked again: how could the industry hope to lobby government for changes in the environment if it wasn't united itself?

O'Neill and others agreed the wider ICT industry needed a stronger voice to keep driving things forward. Currently there were in excess of 100 vendor, user, or industry organisations across computing, software, Internet, wireless, health, and related areas, all seeking government attention. ITANZ was looking for a catalyst for rationalisation and prepared to be absorbed if a new, more representative umbrella organisation emerged. That was in line with a July 2004 report on government ICT procurement that recommended more collaboration between agencies, suppliers, and industry bodies to lower cost and risk, reduce complexity, and improve efficiency all round.

Within months O'Neill had his wish. His organization, formed in the 1970s at the height of the big iron and minicomputer revolution, and powered by chief executives and senior IT people from across the industry, had been absorbed by a new body, ICT-New Zealand (ICT-NZ). ICT-NZ had its first meeting late in 2004, and despite battling with several industry bodies over conditions of membership, saw itself as the umbrella body that would bring cohesion to the heavily fragmented ICT sector and help companies improve their performance in the local and international marketplace. It supplanted ITANZ and the Software Association. The Canterbury ICT Cluster, Health IT Cluster, the HiGrowth Project, the New Zealand Wireless Forum, and Canterbury Software Inc were early members along with InternetNZ.

Peter Macaulay, a former ITANZ president and InternetNZ chief executive,[4] said attempts had been made as early as 1998 to try to establish ICT-NZ and he was hopeful there would be strong cross-industry engagement. While there were still issues over what level of involvement there might be with the 1000-strong Computer Society and the powerfully independent TUANZ, Macaulay suggested, "Even if they aren't going to be in bed together they can at least go to the same motel." That at least should allow each of the different groups to get around the table and develop common streams, which would then allow government to deal with a single organisation.

He said communication between the various groups was absolutely vital for the industry to put a common face on issues. "A blatantly obvious example is child pornography on the Internet; that's motherhood and apple pie stuff. Nobody is going to disagree with that, yet we don't have a consistent industry position on it. NetSafe has got that position and it's, 'Yeah, whatever they say,' but what we should do is have ICT-NZ actually saying 'the ICT industry in New Zealand supports the NetSafe position because . . ..'" If everyone came to ICT-NZ with their issues and it was able to say there were eight organisations totally agreed and two disagreeing then it could work through the areas of disagreement, said Macaulay.

NEW FRAMEWORK EMERGES

After years of working things through, a single architecture, ICT infrastructure, and data standards were finally emerging across the state sector. The e-Government Interoperability Framework (eGIF), for example, created common ground for dealing with all government, local government, and business needs. Under investigation were interagency and local government collaboration including the role of legislation, Privacy Act obligations, and incentives for agencies to develop shared processes. New Zealand's chief electoral office was eager to progress its e-voting pilot in a selected electorate for the

2008 election. "We need to work on our service delivery architecture, secure electronic workspaces and authentication before we can transform government," said Digital Strategy cheerleader David Cunliffe.

We needed to focus on information-rich activities where we create, collect, manage, process and access information. This would include better access from work, home or the classroom to national heritage collections, government information, and databases of publicly funded scientific and technical information. By 2006 the government wanted to provide communities with ICT tool kits to map their assets including buildings, skills, and equipment to determine needs and how best to meet them.

By 2007, he enthused, there would be community-based technical support services in place including training programmes, Web portals, and resources for teachers, school administrators, and the wider education community. This might include e-centres in community locations, such as marae, libraries, homework centres, and Citizen's Advice Bureaus. Many of these centres would assume the new role of 'infomediary,' or guides to the world of digital information. Once all the components were in place, the emerging e-democracy, we were told, would enable instant public access to government information anytime, anywhere, from any device. Ultimately citizens would be able to provide feedback about quality of services or content, and contribute to proposed policies or legislation.[5]

The final Digital Strategy document, after 200 written submissions and wide consultation, was launched in May 2005 by the MED. It was designed to help create the right policy and regulatory environment to target government investment. The vision was that New Zealand would become "a world leader at using information and technology to realise its economic, social, environmental, and cultural goals, to the benefit of all people."

The government committed around $400 million to various programmes. Contestable seed funding of $44.7 million was set aside within the Growth and Innovation Framework (GIF), $24 million for the Broadband Challenge urban fibre-optic network, and $20.7 million to the Community Partnership Fund to help build ICT skills in communities and regions, and create distinctive New Zealand content. Additional funds were made available for cultural and business portals, ICT business productivity workshops, and digital initiatives across government departments including digitising our National Archives and bolstering e-education.[6]

After stepping down as chief executive of InternetNZ, Peter Macaulay had taken the reins of the Digital Strategy secretariat, a role created within the MED. He'd had input into the original document, was familiar with the goals, and passionate about seeing them translated into action. "It was an easy decision to take the job but difficult for me to work within the MED which was totally incompatible with my way of working. They're very good at policy but they do not get operations."

During his 18-month tenure he allocated the bulk of the $44 million Broadband Challenge and Community Partnership funds but the cash dried up before he could complete everything he was commissioned to do. Around 200 organisations had provided input and support. In fact the strategy had gained international recognition for its foresight. Macaulay said he met people in government in Austria, Sweden, and Scotland who knew about the New Zealand Digital Strategy and wished that they had one. "I used to say you can have our Digital Strategy if we can have your connectivity."

He believed the secretariat helped de-silo some government ICT projects and provide an over-arching link between the different departments, as well as developing the content strategy, now under the mantle of the National Library. And while the National Library was well down the track in digitising its own content of archival material, the irony, said Macaulay, was that the National Archives, the National Library, and the National Film Unit didn't want to talk to each other.

After his 18-month contract ended in February 2007, he renewed his criticisms of the secretariat being locked in as part of the policy-making MED, which he insisted was unsuitable

for overseeing operational management. He said it was difficult for someone from a business environment to deliver outcomes within a regulatory environment. "If there was a regulatory issue, say, with Telecom, I couldn't talk to the party involved. That's stupid. I spent most of 1996 not being able to talk to the important parties. You need to remove any operational unit from inside a regulatory environment."[7]

The Broadband Challenge element of the Digital Strategy was designed to improve the availability of broadband Internet access, with seed funding to establish up to 15 urban fibre networks, and network access to rural and poorly served communities by 2009. By February 2006, 35 high-calibre organisations had submitted plans and 13 were asked to submit detailed applications. Six projects won approval.

DIGGING FOR DIGITAL DEPTH

In 2006 the government focused on regulatory reform for telecommunications. In 2007, according to the MED, it would be refreshing its strategies for broadband, high-speed connectivity, digital content, and initiatives around digital capability and security. Prime Minister Helen Clark announced to Parliament in February 2007 there would be a Digital Strategy Summit, bringing together influential New Zealanders from the IT, communications, business, and community sectors who wanted to contribute to the country's economic, social, and export growth objectives.

Digital Strategy V 2.0 would be the key outcome of the refresh programme leading up to, and immediately following, a three-day summit in Auckland in November. Government would ask business and community what else it should be doing to help create a digital future for all New Zealanders looking ahead to 2012 with new initiatives.[8] The overall themes would remain the same: 'connection, confidence and capability, and content'; and the challenge – how to become a high-tech, high-value, creative economy.

It was clear the Digital Strategy had just scratched the surface, and the greatest danger would be to think that throwing a few million dollars at selected projects had solved the problem. Certainly there seemed to be an unprecedented willingness across all sectors to maintain the momentum and drive the new digital economy forward. The previous two years had been highly eventful. Hauled under the broader Digital Strategy umbrella, although not part of its initial ambit, were a gigabit speed science and research network, the launch of free-to-air digital TV and regulatory reform, which opened the way for a much more competitive telecommunications environment, particularly with respect to broadband access.

The amended Telecommunications Act 2006 put the government's seal on full unbundling of Telecom's network and recommended splitting the telecommunications giant into wholesale, retail, and network divisions. After a protracted battle with ISPs demanding better bandwidth access, Telecom, under threat of regulation, had opened the floodgates from October 2006, offering the maximum speeds its copper network was capable of delivering.

Those fortunate enough to live in a neighbourhood close to an exchange with high-grade copper lines and low broadband use, could potentially achieve speeds of up to 7.5Mbit/sec. In most areas, however, it was proving to average 2Mbit/sec–3Mbit/sec. The open slather approach showed up the frailty of Telecom's copper network with more than 10 percent of Internet users now getting slower speeds than previously.

Of connection, 'comfort and capability', and content, the first 'c' still attracted the most attention. The Digital Strategy papers originally set a benchmark for carriers to deliver 'pervasive high-speed broadband;' preferably at least 10Mbit/sec, for residential and small to medium enterprises in towns and provincial centres, using either copper or wireless technologies. Telecom

continued to ramp up its long-awaited NGN with faster fibre roll-out, and was shortening its copper loops and upgrading its copper capability to handle faster DSL2+ technology theoretically capable of up to 24Mbit/sec. In the meantime, the target speed seemed to have mysteriously dropped to 5Mbit/sec, something Telecom could claim it already did 'where line conditions allowed.' Even David Cunliffe now stated 'high-speed Internet access – 5Mb by 2010' in a June speech.[9]

The targets were part of the government's long-stated intention to get the country into the top half of the OECD Broadband Statistics by 2007 and top quarter by 2010 after languishing at 22nd place out of 30 nations since 2003. Our international goals kept slipping, with officials no longer talking about getting into the 'top quartile' but the top half of the OECD figures.

TUANZ chief executive Ernie Newman said one way to improve broadband uptake was to remove the practice of using data caps. The survey showed 90 percent of broadband subscribers had a data allowance cap, a 7.6 percent reduction on the previous six-month period. Data caps were an anachronism and a major constraint in maximising Internet use; ISPs needed to find ways of getting rid of them if stronger broadband growth was to continue, said Newman. The predominant broadband subscription plans were 2Mbit/sec, up from 512kbit/sec six months previously. More than 87 percent of all subscribers had upload speeds of lower than 256kbit/sec. InternetNZ said upload speeds were at a 'snail pace,' making it difficult for consumers to make full use of broadband applications like videoconferencing and gaming.[10]

AN ECONOMIC ISSUE

Newman warned our poor telecommunications performance was no longer just an industry issue, but an economic one. "Our backwater status in broadband among the Asia-Pacific nations was a massive brake on our economic and social development." While the country had the right policy framework in place through the revised Telecommunications Act 2006 and had enunciated an excellent vision through the Digital Strategy, the legislation had come too late and the vision for the future lacked the necessary sense of urgency.

In June he said the Digital Strategy was in danger of becoming irrelevant, largely because of its underpinning institutional structures. "The private sector and other external stakeholders, especially those outside Wellington, have been left out in the cold. Buy-in to the Digital Strategy has been one-sided. I sense it has succeeded in becoming the government's Digital Strategy, but it has failed to become the nation's." The crying need, he said, was to re-engage the hearts and minds of the private sector and to move far more rapidly down the digital path.

He said burying the Digital Strategy within a ministry that had 'a thousand other drivers' to focus on and engaging multiple officials who fitted it in among other priorities was not working. "The Digital Strategy in the widest sense should be given a government agency of its own for a period of five years, and come directly under the auspices of the prime minister to neutralise the vested interests, career concerns and fiefdoms that inevitably get in the way of any cross-agency initiative."

It needed to engage the brightest and best of those who understood the vision and had the technical skills and energy to make rapid progress. "They must have an environment that empowers them and demands they turn the Digital Strategy vision into a reality." He suggested a dedicated Ministry for the Digital Future could put some clout behind indications that the broadcasting and ICT ministries were looking at convergence issues, including future policy for broadcasting and telecommunications. Such a ministry would be the ideal repository for the execution of the Digital Strategy.[11]

What was needed, said industry elder and broadband consultant Laurence Zwimpfer, was an integrated network infrastructure from one end of the country to the other that could easily be extended into all rural areas. What's more, we needed to upgrade our broadband definition. "We have had a lowest common denominator approach. What can be achieved over a pair of copper wires is nothing like the broadband visions many countries now have. We need to know how we are going to achieve this beyond little bits of government money to help keep it visible. There is not enough money to tackle the size of the problem or incentive for commercial players to make the investment needed."

Zwimpfer warned existing plans weren't sufficient to keep pace with future demands. "As soon as we decide 2Mbit/sec or even 10Mbit/sec is a good benchmark it will move on. We have to be a bit clever here; not everyone needs a 100Mbit/sec or gigabit connection but some people need all of those. We need a strategy that can migrate so different users can choose the type of connection they need." It was time to take into account different tariff models for different sectors of society, not just the familiar carrier model which said "the bigger it is, the more you use, the more you pay." That model had crippled the development of education, health, and even local authorities as they tried to keep pace with their user community demands. If local authorities, schools, and the health system were continually concerned about the cost of communications infrastructure they tended not to take risks.[12]

A KIWI BURGER OF CONTENT

In November 2006 a revised e-Government Strategy document was published, reflecting changes in the technology and communications environment and the impact of a growing digital generation who had grown up with the on-line world. As the e-Government blurb pointed out:

> *"Technological innovation is transforming our world and New Zealanders expect government to interact with them in new ways. This means using network technologies that people are familiar with in other parts of their lives: social networking web sites and tools like blogs, wikis, and folksonomies; the full range of digital channels such as mobile phones, instant messaging, podcasts and digital TV, as well as Internet pathways."*[13]

The 2001 e-Government Strategy, together with the 2003 review, highlighted the ways government could use the Internet to increase the value of services internally and to all New Zealanders. The 2006 update took into account the launch of the Digital Strategy and Development Goals for the State Services in 2005, focusing on the inevitability of technological change and the need for government to recognise and meet the challenges. This was an all-of-government approach aimed at transforming how agencies used technology to deliver services, provide information, and interact with people. The focus was now very much with the Internet as a channel for publishing information, and delivering interactive services.

The core goals were:

- *By 2007, information and communication technologies will be integral to the delivery of government information, services and processes.*
- *By 2010, the operation of government will be transformed as government agencies and their partners use technology to provide user-centred information and services and achieve joint outcomes.*
- *By 2020, people's engagement with the government will have been transformed, as increasing and innovative use is made of the opportunities offered by network technologies.*[14]

Part of the Digital Strategy was to have a Digital Content Strategy[15] in place by 2007 with rolling deadlines for communities and government. There was a growing desire to broaden the emphasis on gathering, archiving, and presenting government and community information using the Internet. The Content Strategy would chart a course for a content-rich New Zealand over a five-year period, where New Zealanders would be "actively engaged in the creation, sharing, use and commercialisation of content on-line and in digital form." David Cunliffe said value was driven by content and the policy on digital content should reflect New Zealand's intrinsic nature: "I want to see the Kiwi burger of content."

In the May 2007 budget around $8.5 million over four years was made available to replace Archives New Zealand's 16-year-old file location and tracking system, and other key systems to enable it to archive material that originated in a digital environment. The National Library recognised in its strategic directions to 2017 that the Web would be the centre of the new digital lifestyle that would change our culture and how we interact with information. It said the traditional model needed to adapt in order to be more responsive to users. The Web, it said would be the platform for interaction, information, education, entertainment, and communication.

"As we move further along the digital highway many more records are created in a digital environment and quality systems are essential to ensure these records are captured so they are useable both now and in the future. We want to ensure electronic public records are appropriately maintained by government agencies and are accessible as public archives for as long as they are needed," said Judith Tizard, the minister responsible for the National Library and Archives New Zealand.[16]

However one important group felt sidelined by the whole process. While there was gratuitous use of Maori terminology, and what appeared to be an environment that embraced the language and culture, the reality of what was proposed through the nation's new digital mantra had few specifics.

IT consultant Robyn Kamira, a member of the Digital Strategy Advisory Group, was concerned that many issues relating to New Zealand's indigenous Maori people, the *tangata whenua*[17] or people of the land, had not been embraced in the Digital Strategy even though they had a large stake in the recording, storing, and retrieval of historical information in particular. The Treaty of Waitangi obligations of the Crown, which had in previous years included 'principles of the Treaty'[18] clauses throughout legislation, seemed to have waned. Now it was as if discussions relating to the ancient agreement between the Maori chiefs and the Crown in 1840 had fallen off the agenda.

"The digital world permeates our daily activities to the extent that many tangata whenua commonly use digital tools and media to record, store and manipulate content. The government also has digital repositories of content that are sourced from or created by tangata whenua. These repositories are held within its museums, libraries, archives, courts and numerous government agencies." Kamira said it could be argued that these combined repositories represent the largest collection of such content in the world. "The issue of how to protect and use this content, and how to ensure it benefits tangata whenua, is cause for ongoing tension with the government ... because the ownership of content held by government institutes is not agreed and legislation does not recognise collective ownership[19] or the kaitiakitanga[20] roles and processes of tangata whenua."

Kamira said even the 2006 Digital Content Strategy failed to recognise the Treaty of Waitangi and its relevance. While the drafting of this document should have provided an ideal opportunity to address outstanding issues of ownership and caretaker rights of Maori content, the failure to include the Treaty meant there was no leverage to work towards such a resolution. She said the

Digital Strategy and its sub-strategy for content simply reduced tangata whenua to 'community' alongside pony clubs and other interest groups, and in doing so failed to recognise the historic and spiritual body of Maori and the intergenerational and unique nature of Maori knowledge. This was inconsistent with the content strategy's statement that "Maori language, knowledge and culture [is] a vital part of New Zealand's identity."

To eliminate the high risk of loss of content, she said the digital strategies needed to identify tensions between government and tangata whenua with the aim of resolving ownership and kaitiakitanga issues and to reduce lost content, or content that was out of context because it was dislocated from the source.[21]

GRAZING IN THE COMMONS

The idea of a commons or a neutral place where commoners might graze their cattle or grow gardens, or the concept of resources 'that a community recognises as being accessible to any member of that community' has long been debated. For example, is the information of academics or local and central government a public good resource that should be freely shared or a commodity that can be bought and sold? The digital environment has had a huge impact on the flow of information and the way it is shared adds further fuel to the debate of what might constitute an electronic commons. Is this merely a collection of useful Web addresses, access to wikis and content development tools or can it go much further?

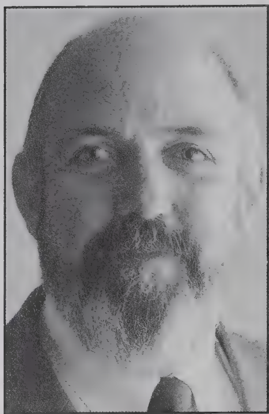
Creative Commons, launched in 2001 and headquartered in San Francisco, is a global movement to establish a middle way between extreme copyright controls and uncontrolled exploitation of intellectual property. To achieve this, a range of freely available copyright licences were established to allow creators to fine-tune control over their work and enable wider distribution.

Creative Commons was originally grounded in American law and practice to counter the effects of what its founder Lawrence Lessig termed ". . . a culture in which creators get to create only with the permission of the powerful, or of creators from the past." He said modern culture was dominated by traditional content distributors in order to maintain and strengthen their monopolies on cultural products, such as popular music and popular cinema, and that Creative Commons could provide alternatives to these restrictions. It spread worldwide under the auspices of Creative Commons International, with 35 national licences so far established.

Through the Council for the Humanities, New Zealand is one of 44 countries involved in a project to create an indigenous set of Creative Commons licences. Through Creative Commons Aotearoa it is creating six new local licences.[22] The most restrictive licence, 'Attribution: non-commercial, no derivatives,' allows others to download works and share them, as long as they mention and link back to the author. However they can't change the item in any way or use it commercially. The least restrictive, 'Attribution by,' lets others distribute, remix, tweak and build upon a work, even commercially, as long as they credit the author for the original creation use. All the licences allow the author to retain copyright outside of the licence's specific fair provisions, and all are applicable worldwide for the duration of the work's copyright.[23]

CRITICAL DOCUMENTS ON-LINE

The New Zealand Public Service had adopted new Web standards that emphasised accessibility regardless of technological or physical impediments. Government Web Standards v 1.0 replaced the previous guidelines and was formulated by a working group of ten reviewers representing government, people with disabilities and usability professionals. "The e-Government Strategy



Laurence Millar, deputy commissioner for IC&T within the SSC.

highlights the importance of accessible State Services in transforming the operation of government. These standards provide the building blocks for ensuring government web sites are accessible to all," said Laurence Millar, deputy commissioner for ICT.

The new standards would help remove duplications and dated material, and focus on making information more useable. "This will give government agencies much more clarity and direction around how they use the Internet as a means of delivery." Public Service departments would be expected to comply with the new standards, while state sector organisations were being encouraged to follow suit. Local government and the private sector were encouraged to adopt the standards.[24]

Central and local government were making significant inroads in getting their own communities in line, and documentation and processes on-line. By August 2006, 99 percent of government organisations had access to the Internet and 97 percent had broadband; 93 percent of government staff had Internet access compared to 43 percent of business staff, according to a Statistics New Zealand report. It showed 77 percent of government organisations were planning to invest in new or upgraded software, desktop hardware or ICT in the year to August 2007. Obstacles to implementing new ICT solutions were competing priorities, budget constraints, and a lack of qualified people.

More than 60 percent of forms and documents needed for public dealings with government were available on the Web and 26 percent of government organisations offered transactional services on their web sites compared with 34 percent of businesses. The report said 30 percent of people obtained on-line information about government organisations or public authorities on-line in the 12-month period and 18.6 percent of individuals downloaded or completed government forms on-line while a 10 percent made payments to government departments.

While it hadn't been widely publicised the Statistics Department opened the way for on-line forms to be filled out by New Zealanders during the Census of 2005, and the response was considered a resounding success. There was on-line filing for tax and GST returns, ACC forms, company registration, statistical information and customs forms and outstanding fines could even be paid on-line from September 2007.

Inland Revenue had developed and launched a comprehensive e-Enablement Strategy, setting out a series of 52 linked initiatives. The Ministry of Social Development had installed a consolidated voice and data network with a toll bypass facility across its 240 nationwide sites. Moves were afoot to speed up the judicial process, enabling lawyers and police to file legal documents with the courts electronically. While a law change was still required, e-filing in conjunction with a $41.9 million investment in case management system could enable many commercial elements of commercial case work to be conducted outside the courtrooms and managed remotely.

Courts Minister Rick Barker told Parliament's law and order select committee in June 2007, that courts' current business processes were a Dickensian way of handling information, involving 'mountains of paper.' The modern solution was digitising everything to be accessible 24 hours a day, seven days a week, remotely and by multiple people. The ministry had brought together systems operated by the Justice Ministry and the Courts Department during a 2003 merger. The ministry signed a $55 million IT contract with Telecom's technology services arm Gen-i in February, reducing its technology suppliers from twelve to one.

PRESERVING THE FUTURE

'Continuum – Create and Maintain' was a whole-of-government approach to record-keeping, designed to help government agencies meet best practice record-keeping standards, so that the most significant records of government were preserved now and for future generations. The long-awaited Public Access to Legislation (PAL) project was going through user testing in May 2007, ahead of implementation later in the year.

The extensive testing phase for drafting and publishing legislation across several government departments was to determine with certainty that the system functioned according to specifications in a 'production like' environment, loaded with copies of all legislative data – more than 7000 acts and regulations. Prime contractor Unisys was also testing performance. Even after release, legislative information from the PAL web site would be regarded as unofficial. Correcting punctuation and layout for consistency of style up to the high specifications of the Parliamentary Counsel Office (PCO) could take another three years before it was considered an 'official version' New Zealand legislation.[25]

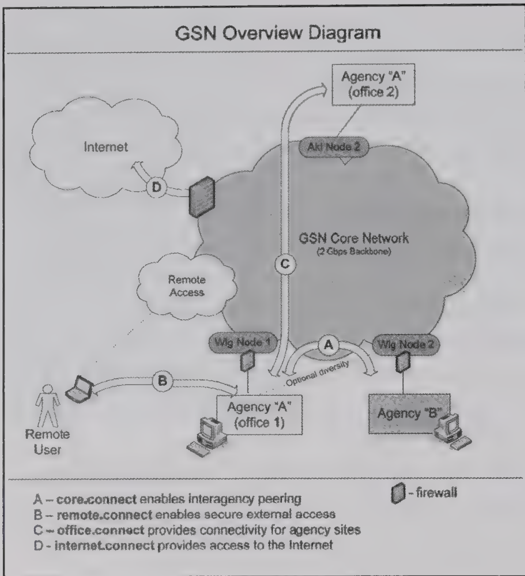
In fact there was so much activity in e-government that the State Service Commission (SSC) reported a $32 million surge in spending over five years. By June 2007 it was revealed that spending on e-government initiatives accounted for 40 percent of all SSC spending, and contributed to an overall increase in spending of 125 percent over the previous five years. In the 2003 financial year SSC spent around $25 million, while in the 2008 year it was budgeted to spend $57.6 million. SSC e-Government director Laurence Millar explained the business case was based on the delivery of future benefits. The payback would be in taking costs out of government as a whole. The lion's share of the increases came from funding the Identity Verification Service (IVS) and the Government Shared Network (GSN).

Millar said each investment contributed towards the SSC's strategic e-government goals of accessible state services and 'joined-up' service delivery. Projects including secure email, the all-of-government portal and delivering collaboration tools had all contributed to the cost along with secure collaboration tools and document sharing. The public sector secure private network, a resource that sat between each agency's individual intranet and the broader Internet, also came at a cost.

Other projects being developed over a number of years required incremental investment, including the all-of-government authentication programme, which began around 2001 and had delivered the Government Log-on Service and two-factor authentication for government users. The next stage was the Identity Verification Service, which won $9 million in funding over two years in the 2007 Budget and would authenticate external users. "The GSN initiative is expected to start generating a positive return from the middle of 2008," said Millar.[26]

By the end of 2007 the GSN, a highly secure, nationwide, industrial-strength Internet and telecommunications provider owned by the state was delivering the best possible bang for the public buck to local and central government agencies. It had been approved in June 2005, and a year later the strategic and financial go-ahead was given and the roll-out began. The first agencies were onboard by mid-2007. Rather than allowing agencies to continue with the ad hoc approaches to ICT of the past, the GSN finally enabled them to standardise, aggregate, collaborate, and share resources.

In fact David Cunliffe warned government agencies that if they didn't commit to join the GSN he'd want to know why. He emphasised at the GOVIS (Government Information Systems Managers) 2007 conference that the Crown had made significant investment in a highly capable and secure system and indicated non-use of the GSN would not be taken lightly. He was no doubt wondering how much might be trimmed off the total government operating expenditure budget on ICT, which in the 2006 financial year was $1.1 billion.



Government Shared Network (GSN) design.

NO MORE ISOLATION

SSC e-Government projects manager Edwin Bruce said government agencies could no longer work in isolation as they were increasingly required to move data between each other, the public, and businesses. "You are somewhat constrained in what you can do over the public Internet. Without a secure GSN you end up with point-to-point links everywhere. This is an opportunity to rationalise those links. There only needs to be one point of connection to get to all the other agencies in a secure and high-speed way, and from a cost perspective we're very competitive," he said.

"The number of Internet-based attacks on government web sites is on the rise and this alone has been a solid argument for consolidation; in fact security was pretty much top of the list, a distant third was the opportunity to exploit consolidated purchasing." At least 16 suppliers were involved in building the gigabit nationwide network, which raised the bar on all existing offerings with guaranteed end-to-end performance enabling applications to be delivered centrally with no bandwidth bottlenecks. There were plans for speeds to shift up to 10Gbit/sec.

IBM was responsible for managing and monitoring the network and all the supplier arrangements, Revera (formerly HDS) and Datacom Systems supplied the data centre capabilities and FX Networks and DTS (Data Traffic Services) delivered the high-end ISP capabilities. Data tails and backbone capabilities were acquired from a range of suppliers including Telecom, FX Networks, Kordia (formerly BCL), Vector and CityLink and ultimately other providers of metropolitan fibre networks.

Early adopters were Maritime New Zealand, the Department of Labour, Archives New Zealand, the Ministry of Education, and Te Puni Kokiri. The Ministry of Education signed up to connect 60-plus sites. Health was in dialogue about the possibilities, and the Ministry of Social Development believed the network specifications were a good fit for its needs. By early November the Department of Prime Minister and Cabinet, Ministry of Foreign Affairs and Trade, SSC, the Department of Internal Affairs, and the NZ Police had signed up.

NZ Police would be able to provide high bandwidth between key communications sites and data centres, with the GSN delivering quick access to vital information, which could be crucial to police operations. The DIA would have a single point of access to other government agencies and greater bandwidth and greater diversity than its existing network for implementing larger IT projects.[27] There was potential for up to 300 government departments and agencies to join, including local authorities.

The SSC effectively owned the core network infrastructure including switches and routers which were predominantly Cisco, and the security infrastructure was a mixture of Cisco and Juniper. This equipment was located at the Datacom data centre in Auckland and the Rivera centre in Wellington. Then there was the CPE for each of the client sites, preconfigured to the security and

capability standards of the GSN. "The reality is that implementing this level of encryption over public IPNetworks is bloody expensive, including over the telco networks. Even the biggest agencies find it difficult to make a business case for this, and for the smaller and medium sized ones it's out of the question. The GSN has been engineered so everyone gets the highest security levels from day one," said GSN project manager Michael Foley.

The fundamental building block and access point into the $23 million network was core. connect; typically a 1Gb or greater interface between an agency's data centre and one or more of the GSN nodes. Using virtual firewalls agencies could build virtual private networks (VPNs) to any other agency as part of the controlled access network community. There was wide area office connectivity for agencies to get out to their own branches, including wireless connections for more remote areas, and a full Internet gateway tailored for high-level government communications needs. A remote service for outlying offices and mobile workers was also on the agenda. Key to the GSN was the eGIF, which created common data service formats freeing agencies up from technical obstacles of the past and enabling different files formats and types to be easily interchanged.[28]

Top of the list for GSN as far as infrastructure went was dark fibre, now available along the backbone of the North Island from FX Networks and in the metropolitan areas from Vector, CityLink and a growing number of public-private urban fibre providers, including those that received 'broadband challenge' funding. So how was the GSN roll-out paid for? There was a Clayton's budget, the kind of budget you have when you don't have a budget. It was being debt funded, in other words there was a huge overdraft facility – around $23 million – which it could dip into on an 'as needed' basis.

"We'll draw down that debt as required and dive into the red while we're building and deploying and as revenue starts appearing it will cover operational and fixed costs with a cycle to reinvest as we go along." Edwin Bruce insisted there wouldn't be any profit made from the GSN although he was confident it would break even and the cash should start rolling in from March 2008.[29]

LOCAL GOVERNMENT LINKS

The e-Government Strategy launched in March 2001 included a plan for local government to be: "Structured, resourced and managed to perform in a manner that meets the needs of New Zealanders in the information age, and which increasingly delivers information and services using on-line capabilities." Under that mandate local government set its own strategy, which began to take shape at workshops in August 2002.

The resulting April 2003 e-Local Government Strategy[30] aimed to deliver easy on-line access to information and services, develop innovative products and services, enhance participation in local democracy and provide community leadership on e-business initiatives. The overarching goal was, wait for it… 'for New Zealand local government to be a world leader in e-local government.'

Local Government New Zealand championed the plan, which would attempt to achieve a more collaborative approach between local authorities and central government. This meant sharing information and services, greater participation by citizens, and promotion of local leadership for community and business e-enablement. Improved access to ICT through learning centres, training programmes, tools, and affordable high-speed Internet services were also on the agenda.

In a July 2005 speech David Cunliffe urged councils to identify wider challenges facing the community in the future. "How can we encourage teleworking to reduce traffic? Could old computers be put out with the recycling? What is the council's role in managing e-waste?" One of the key challenges, he said, was to ensure that all local government agencies worked together to achieve common ICT goals and outcomes. "It is important that agencies partner together to ensure that the benefits of the strategy are as wide reaching as possible."[31]

The e-Local Government Strategy was built on by councils based on common guidelines and deadlines. By 2007 they had established a set of core and non-core services on-line; for example ratepayer interaction for building, resource management and licensing, and providing core information on their web sites accessible from the local government portal. There were a range of local government web sites for different sectors. Transactional systems and on-line billing were being worked on as was the goal to ensure all New Zealanders had access to, and training in, ICT through schools, libraries and the community.

At the July 2007 Local Authorities Conference in Dunedin, Local Government Minister Mark Burton was impressed with the clustering activities of local authorities which were creating their own development strategies for shared services and access to resources across regions. He singled out the fact that nine lower North Island councils had banded together to produce the Wellington Regional Strategy, a sustainable economic growth strategy for the region; three authorities in the Western Bay of Plenty had formed a 'Smart Growth' initiative to address social, economic, and environmental issues and the Regional Sustainable Development Forum had produced the 'One Plan' project in Auckland to strengthen the regional strategy and promote social, economic, cultural, and environmental well-being. Burton said the role of central government was as supporter or facilitator to help clear the path for such clusters, through co-ordination and funding.

LOCALLY OWNED LOOPS

Local Government On-line (LGO) was acting as a catalyst to encourage fibre-optic build-out of community networks and facilitating discussion groups, collaborative software development and a common Web portal for councils. The limited liability company was owned by the four major local government organisations, Local Government New Zealand (LGNZ), the Association of Local Government Information Managers (ALGIM), the New Zealand Society of Local Government Managers (SOLGM) and Civic Insurance, the insurance company owned by the councils. It ran the Internet platform for local government including the local government on-line portal (www.localgovt.co.nz), a major portal where all the councils hosted their long-term community and annual plans.

LGO handled the communication between councils through a shared services approach. This included a local government on-line tendering room used by about 60 councils for electronic tendering. It also ran about 90 listserves or email discussion groups on specific topics, and operated nine shared workspaces. Chief executive Jim Higgins said the IT managers list was "hugely busy with people exchanging information." There was also an ICT Working Group where central and local government representatives collaborated on projects. LGO was also involved in a small amount of software development, including on-line forms that all 85 councils could use, a major emergency management system which was trialled at Hutt Valley Council before being rolled out to the rest of the country, and a database for pollution management.

"One of the pollution control guys from Far North District Council told us they'd gone through the complex processes of bringing a court case against a company caught polluting, only to discover the same company was also facing court action from the Southland District Council for the same thing. Now we've built a database so councils can go straight to court if they find the same company is doing this elsewhere and ensure they get a big fine." Higgins said the collaborative approach also worked as an informal way of keeping in touch over dangerous dogs, for example. "A dog ranger may realise a family with a dangerous dog has left town and swap notes with other councils to look out for them."

However Higgins said the build-out of community networks by local authorities was still embryonic. "We began talking to them in 2004 but there wasn't a lot of interest. Some IT managers

saw it as an opportunity but others said it wasn't their core business. That's changed and there's a lot of interest now with councils getting projects together and partnering with businesses and telcos."

Many councils were aware their own web sites were becoming harder to manage as they began moving into e-government and needed a lot more grunt. This was also seen as an opportunity to get money from central government through the Broadband Challenge. Higgins said there was an unspoken acceptance within some councils to move into communications. "Many were already in the infrastructure business with water and sewerage, and in the past gas and electricity, so why wouldn't they get involved?"

He said the Broadband Challenge, which required councils to come up with a workable business plan and to form partnerships with local businesses, schools, hospitals, and the community, now had many councils working through those issues in the hope there would be a next round of funding.

What was missing at some councils was a keen individual who would get the vision and run with it. That had to happen without too many case studies of what could be achieved, as most of the fibre networks were still being rolled out. And while there was no grand plan across the country for connected networks at this stage, Higgins said that's how the Internet evolved in the first place. "A lot of disparate networks appeared around the United States and then got bolted together. That's what will happen here – lots of little high-speed networks springing up. Someone has to do it and clearly it won't be Telecom or TelstraClear."

Discussions continued about a common national network, and whether the GSN would welcome local government involvement. It would be handy for exchanging the primarily land-based data that moves between local and central government but there wasn't a lot of other high-value data moving between councils. It was far more important for councils to get their own local networks together first, and that, said Higgins, presented its own difficulties when some places still couldn't even get a good enough connection to pull up a Web page. "There are issues around getting better bandwidth out to remote areas and ensuring they're not disenfranchising people when they move further into e-government. A serious number of councils are looking into these issues now," he said.

CLEVER COUNCIL'S COMMENDED

There were many examples of innovative ICT solutions transforming central and local government. The Smarter Systems Project of Libraries for a Greater Auckland Region (eLGAR) used a single library management system across Auckland City, Manukau, North Shore, Rodney and Waitakere Libraries.[33] The Botany Library in Manukau City was New Zealand's first retail library using radio frequency identification (RFID) technology to manage a book collection.[34] The Ministry of Culture and Heritage's *Te Ara, the Encyclopedia of New Zealand* was thought to be the world's first digital national encyclopedia. It was developed over many years, with a range of rich information layers for different users including students, people living overseas and scholars.[35]

The Tauranga District Council's National Dog Database, the National Library of New Zealand's Web Curator tool, the GeoNet project from GeoNet Science and the Department of Internal Affairs' Electronic Monitoring System were all further examples of government innovation winning a place in the finals of the *Computerworld* ICT Excellence Awards.

In addition to chipping New Zealand's 500,000 canine companions, the National Dog Database links their details nationwide across 73 territorial authorities. The system is updated daily and allows animal control officers to search all dog registration, classification and infringement data in New Zealand. The National Library's Web Curator Tool supports the selection, harvesting, and quality assessment of on-line material. "It lets librarians collect web sites the same as they collect books

so our important digital heritage can be preserved," said National Library technical analyst Gordon Paynter. The new tool, developed with the British Library for $379,000, uses open source software across multiple operating systems.

The GNS Science GeoNet Project monitors earthquakes and advises people how to respond. Developed with the Earthquake Commission, GeoNet also assesses volcanic movements and landslides and a tsunami warning system is on the way. It also uses free and open source software and is designed to integrate with many systems to allow the widespread dispersal of information. Web hosting is done internally, but Web servers are based in California in case Wellington is taken out. GeoNet allows seismic and GPS data to feed into the same system, helping the study of what causes earthquakes and landslips to better determine their location.

Another innovation has been the Department of Internal Affairs' Electronic Monitoring System (EMS) $42 million, IP-based, WAN linking New Zealand's 20,000 gaming machines across 16,000 pubs and clubs. The project helped the government monitor the country's pokie machines to ensure they paid out fairly and appropriate duties were paid.[36] And the Weather Information Service Engine (WISE) from the MetService provided on-line weather, including five-day urban, alpine, marine and coastal observations and forecasts.[37]

COMMUNITY STILL CONFUSED

While the government continued to emphasise the need for strong links with the community, and for greater collaboration and co-operation between community groups, there appeared to be no cohesive strategy to encourage all parties to achieve that. Initiatives were prefaced with the desire to encourage local solutions to local problems, build government and voluntary sector partnerships and provide services to citizens and customers through best use of information technology. However concerns were being expressed about the number of overlapping initiatives.

The DIA continued to upgrade and promote CommunityNet Aotearoa as the portal of preference for community and volunteer groups while the New Zealand Federation of Voluntary Welfare Organisations (NZFVWO) was getting a major technology upgrade, as were the Citizens Advice Bureau.

NZFVWO had funding for its community information management systems (CIMs) project approved in July 2007 to help the community and voluntary sector establish a 'shared workspace,' which would allow organisations to host their communications networks, including discussion lists, electronic newsletters and magazines, and email notifications using a common ICT platform. Since November 2006 a number of national organisations and individuals had committed to the project including Association of NGOs in Aotearoa (ANGOA), Volunteering NZ, NZ Council of Social Services (NZ COSS), Philanthropy New Zealand, Centre for Social Health Outcomes Research and Evaluation (SHORE), NZ Association of Adolescent Health & Development (NZAAHD), the UNITEC Not-for-profit Management Programme, Whitireia UPLIFT programme, Centre for Social Research and Evaluation (MSD), and Evolving Enterprise.

While there was a lot of talk in the Digital Strategy and other initiatives about collaboration and co-operation between community groups, Peter Sykes, director of the Mangere East Family Services, who'd been involved in the community sector for 25 years, said there was zero funding set aside for this. According to Statistics NZ, there were 97,000 people involved in community sector groups, all trying to access and share information. Only in the past 15 years had groups at the regional and national level started to value their work together, he said. "In the past you did your own thing and that was encouraged by local and central government, which didn't want these sectors to become too strong, they liked to maintain some level of control."

He and other community representatives had been trying to explain to government that they couldn't get funding for collaborating, co-ordinating, or networking. "A lot of groups are doing great work but information sharing is not always taking place. It takes time to go to meetings to find what other groups are doing because they're so busy working to meet their own outcomes." Sykes said the community sector was only starting to realise it couldn't keep creating new organisations. "There aren't the volunteers or resources to do that. So how do you set up memorandums with other groups without having to form a legal structure? How do you promote collaboration?"

Meanwhile the DIA continued to contribute 'several hundred thousand dollars' in direct costs, maintenance and running the server and employing a three-person team running the CommunityNet Aotearoa (CNA) Web portal. From December 2003 it had openly stated it wanted to be first port of call for community organisations in New Zealand. "We will know when we have reached this point when CommunityNet Aotearoa is the start page for everyone working in and with Maori and community and voluntary groups and all such organisations have a link to the site from their own web site," the advisory group had agreed.

CNA provides how-to guides, news, discussion groups, information-sharing, practical resources and hundreds of Web links to community resources and information across the country. It was launched in November 1998 as part of the Communities On-line strategy; a major update was completed in 2003 and another overhaul was underway in 2007. It was added to the list of key government Digital Strategy initiatives in May 2005 for its ability to provide 'free, convenient access to relevant, quality information' which could raise the profile and capability of the community sector and encourage information sharing between organisations. It was, however, only getting around 30,000 hits a month as at September 2006.

A new site manager had been appointed, technology was being updated to make user access easier, the links directory had been split into regions, making it easier for volunteer and community organisations to find each other, and data management services and software was being reviewed to more effectively deliver content. The site already had RSS feeds for distributing news headlines and more concise content, but in the future might be required to deliver material to mobile computers and cellphones. Through these transitions it had to be aware of those who didn't have access to the latest technology.

"Despite the broadband rhetoric there are still a lot of people on dial-up and older computers that can easily be jammed up if we use the latest software from Microsoft and others. Our goal is primarily people interfacing with people and we don't want technology you can't access," said Peter Sykes, founding advisory group member. "No community group could maintain those kind of costs, and while there are a number of other groups providing information for the community, voluntary welfare and social services community, CommunityNet Aotearoa is the only portal bringing them all together and pointing back out."

The plan was to build greater support for the Maori, Pacific Island and migrant sectors, so they felt more confident contributing to and using on-line content; and to foster greater mainstream understanding of what was happening in those sectors. However Anglican Trust for Women and Children chief executive and former advisory group member, Wilson Irons, while convinced CNA had a strong future, said not enough people were linking their resources there. "Social services needed a clearing house as a gateway to a number of sites. That's how it was set up but it never got there because it wasn't updated and needed lot of resources."

COLLABORATING SEPARATELY

There were also concerns about ownership and loss of focus as more people put their energies into their own web sites. What was needed, Irons suggested, was for the site to become more

of a library for the community where people could download policies, procedures, discussion documents, newsletters and information from across the different sectors. Currently, he said, the duplication of information across all social services, community notice boards, and agency web sites was confusing.

One organisation which has a wide-ranging infrastructure and had been involved in an advisory capacity in the early years of CommunityNet Aotearoa was the Citizens Advice Bureau. With a change in staff over the years its commitment to the community site had waned and it had instead focused on updating its own extensive resources. Andrisha Kambaran, senior advisor at CAB's Wellington headquarters, said there was no longer any formal arrangement with CNA nor were there any plans to be involved with it in the future. She suggested that the reasons for the site in 1998 might well have been much stronger when there were barriers to having a web site or using the Internet for community organisations.

She wondered how well the site had adapted to the changing times and whether it was still relevant and appropriate for DIA to continue funding it. Since the Digital Strategy was announced, many community groups had embarked on 'a significant technical upscale' to help them achieve their objectives and expand into new territory. CAB received $1.27 million from the Digital Strategy Community Partnership Fund (CPF) to enable the organisation to develop an integrated ICT infrastructure to increase its efficiency, accessibility and effectiveness. Some of its partners also contributed an additional $330,000.

The funding would "strengthen the well-being of our communities by enhancing New Zealanders' abilities to realise their social, economic, civil, political, and cultural rights and their ability to participate more fully in democracy and society." CAB had 2700 volunteers with 27 different nationalities represented and had 620,773 client inquiries through the 2006 year and about 36 percent of its clients were migrants.

CAB's own digital strategy project would be "truly transformational," said Kambaran. "We are certainly thinking big; an interactive web site with everything from digital stories to multilingual functionality; an enhanced intranet with a new content management system, including using digital media as a training tool for CAB volunteers; a networked environment for all Bureaus so that all computers in the organisation can access a centralised database of information." The new funding would also allow the purchasing of standardised computers and applications for all bureaus.

She said the CAB, which operates from 91 locations from the Far North to Invercargill, was integral in making information that was important to people's lives accessible, and offered a path-finding role, helping the public find the appropriate support or information. It would provide information and links to more than 50,000 organisations from its database with a focus on individuals seeking information, as opposed to community organisations seeking support.

TRUE E-DEMOCRACY DENIED

Getting communities across the country to engage in the decision-making process at local and central government level would be a major step towards meeting government direction statements. Whether the public sector was really listening to, and prepared to act on, the outcomes communities would like was another question altogether.

Andy Williamson, head of the Digital Strategy Advisory Group and community informatics researcher with a strong focus on citizen-led e-democracy, warned e-democracy in New Zealand was a flawed and failing ideal. His research pointed to significant frustration on the part of community activists who often felt unheard, and that any progress was hard fought for, and slow in coming.

While the Local Government Act 2002 was designed to create more consultative models of local government, he claimed the reality was little more than rhetoric.

"Councils value the community voice less than their own opinion or the advice of paid external consultants. It's like a game, where community input is sought but only acted upon when it aligns with council's own agenda. It's what I call 'benevolent bullying' in my research. Council appears to 'play fair' but in reality arrogantly position themselves as expert and the community as less informed, even troublesome and certainly problematic."

The biggest obstacle in getting e-democracy, or for that matter broadband roll-out or community ICT up and running, is that the innovators continually ran into 'a government-manufactured brick wall.' "Local government in particular is hugely risk averse and won't really dare do anything new or original. It seems to me that it is terrified of innovation or of being first. No one wants to stick their head up and make a decision. Central government is much the same. It's chicken and egg – they don't want to employ new tools, because they are unproven. Well, how convenient. There is also a lot of fear around e-democracy, those in power fear losing it. It's often as blunt as that. Local government is a fascinating case study but all parts of government I've encountered in New Zealand and overseas would rather listen to a consultant than a citizen."

He said the rise of a technocracy shifted decision-making away from elected representatives towards 'experts,' where decisions were based on science and professional knowledge, rather than public opinion. "There is an opportunity for citizens to reclaim their voices at a time when increasing decentralisation of decision making is mirrored by declining democratic participation and a public perception."

Williamson said both the Community Sector Taskforce and the New Zealand Council of Christian Social Services stated they felt ignored by government when they had tried to communicate their needs, despite putting their views clearly. "I'm reminded of John Kenneth Galbraith, who once observed that government was 'mentally moribund, seriously incompetent and, on frequent occasion, offensively arrogant'; 25 years later little has changed."

He said it was still early days for citizen awareness of what ICT could achieve. "Even experts in e-democracy confuse the subject. I read an article in a newspaper recently entitled 'e-democracy' but it was simply about party election web sites, which is only a small sub-set of the topic … which just maintains the status quo, albeit on-line. We need more focus on the third party transformative sites that provide comparisons of candidates' comments, previous speeches, where people really stood on issues, to help the voter cut through the haze of promotional rubbish."

He said he didn't believe ICT was the ultimate driver for a fully democratic model where public authorities became only regulators. "The system has a vested interest in maintaining its position at the top. The technocratic shift in government, in the OECD at least, is now so complete that governments would require scientific and technical reports to validate participatory democracy, and no consultant is going to do themselves out of a job that easily." Also, this suggested some kind of technological determinism, whereas the real drive for adoption was social. The real driver for governments using ICT, he said, was economic expediency. "Some new participation models no doubt will emerge but these won't go to the heart of the democratic process, they will simply be new ways into the existing underlying process."

The challenge was for citizens to use the tools at their fingertips, or risk remaining in a 'culture of bureaucratic dysfunction,' where policy development had become highly academic, had lost touch with practical service delivery, and had no real respect for community sector knowledge. "Communities are over-consulted and then ignored. Along with falling rates of voter participation, this challenges the legitimacy of local democratic processes and leads to an increasing perception that local government is detached from the community."

MOCKERS AND BLOCKERS

Government was certainly taking every step to make itself more connected and was even providing its own content in an effort to become more transparent. It used its own transmission and network company, Kordia, to install, operate, and maintain a system to Webcast parliamentary proceedings from mid-July 2007. When the House of Representatives is sitting, around 17.5 hours of proceedings are televised each week by eight remote-controlled cameras. Anyone can view the sessions on-line, although only question time is covered in full.[39] The in-house TV service broadcasts footage of political debates.

The project was designed to make proceedings in the House more accessible and to improve the public's understanding of the democratic process. "Televising Parliament is valuable to democracy, as it gives the public the ability to see how legislation is made and how the government of the day conducts itself," said Speaker of the House, Margaret Wilson.[40] Ironically only weeks earlier MPs had voted on a new set of rules around the broadcasting of parliamentary proceedings, extending what could be filmed, but banning any images that satirised, ridiculed, or denigrated MPs. Of course that simply became food for the satirists who upped the ante in a media challenge to the ruling, running as much old footage of MPs asleep on the job, making rude gestures and acting out in public places as they could find.

In the past news organisations had been denied access to the House for a period when they ran foul of parliamentary grace but under the new approach, it could be considered a contempt of Parliament, and even result in imprisonment. Journalists in Parliament's press gallery and the Commonwealth Press Union's media freedom committee criticised aspects of the new rules as an attack on free speech. Previously newspapers were only allowed to use images of MPs on their feet speaking, and they protested that the new rules extended the allowable use of images of MPs reacting to events to TV only. TVNZ, TV3, Maori Television, and Sky News said they would ignore the new rule relating to satire, which had the potential to erode democracy.

"The banning of the use of images from the debating chamber for satire is a precious overreaction by MPs and unnecessarily puts limits on New Zealanders' understanding of politics," TVNZ news boss Anthony Flannery said. "The public has a right to see how their elected representatives behave and perform in Parliament – warts and all." TV3 news director Mark Jennings said lighthearted and satirical coverage of politics was as old as the news media itself. Act and the Greens expressed sympathy with media views, but Deputy Prime Minister Michael Cullen accused journalists of overreacting.[41]

Then after a solid year of urging New Zealanders to get with the digital programme, bolster export capabilities and lift GDP and our standing among our OECD peers, the government handed the marketing campaign offshore. The $11.5 million Buy Kiwi Made campaign was facing claims of hypocrisy after the MED handed a $6.3 million contract to international marketing M&C Saatchi – with directors based in Australia, London, and Auckland.

The scheme set up to champion New Zealand products overseas, was described as being a 'a bit hypocritical' by Norsewear New Zealand chief executive, Robert Linterman. "If we are buying New Zealand-made, what are we doing buying offshore resources? Even though they are a good company, surely there is someone domestically who can do this? It seems to fly in the face of what they are trying to do." Christchurch outdoor clothing firm Earth Sea Sky owner, David Ellis, said he found it 'unbelievable' the Buy Kiwi Made campaign could not be run locally.

Official spokeswoman for the campaign, Green MP Sue Bradford, said M&C Saatchi was working with Kiwi firms and producing professional results. "It is not as if they are some company that has come in from outside without any understanding of the New Zealand context."[42]

ABOUT THAT STRATEGY

David Cunliffe remained confident the Digital Strategy was the appropriate framework for the government's plans to boost our digital competence but agreed its governance and co-ordination mechanisms needed strengthening. He said the period to mid-2008 would be 'absolutely and historically critical' for New Zealand in terms of implementing the new telecommunications regulatory system, bedding it in terms of market behaviour through the Commerce Commission, and addressing remaining outstanding issues.[43]

New Digital Strategy programme manager Janet Mazenier had worked in the ICT industry for more than 15 years, previously as Telecom's programme manager for Project Probe. She found her early days stressful and her resources pressed, but by the beginning of August was surprised at the huge goodwill and offers of help coming from government and the wider market. Regulatory changes in telecommunications in particular had made New Zealanders more aware of the digital future, with a growing number wanting to know how to get on board.

"We haven't been particularly effective in the past in telling people what we're doing but an enormous amount of work has been done, and as the process of the strategy has touched a number of sectors and communities the awareness has grown virally." There were 111 community partnerships and 57 other initiatives across government that had all been funded or were being funded, including the Broadband Challenge projects, five MUSH (municipal, university, school, hospital) networks and three projects in remote and under-served areas.

TIME TO BACK WINNERS

Mazenier agreed there was a perception the vision for transformation had been 'for government by government' but insisted the government wanted to look at new ways of engaging with business and communities. So would the coffers be refreshed for another round of Broadband Challenge and Probe funding? Would the Digital Strategy secretariat adopt a new structure? Mazenier wouldn't pre-empt any decisions, only saying all options were up for consideration.

There would be ongoing consultation across all sectors which ultimately would be synthesised into strategic initiatives. A draft document outlining the contents of a potential Digital Strategy V 2.0 would be released early in 2008 as part of a work plan to narrow down specific outcomes that would remain current and relevant through to 2010.

Engaging those outside government remained a challenge. Community research and e-democracy advocate Andy Williamson said the early stages of e-democracy seemed to involve those who were already motivated. Mass engagement seemed to be largely issues based; something that directly affects us; for example, crime, environment, and planning law. ICT needed to be used in a way that increased interest and awareness through communication or even new ways to engage such as SMS polling. Citizens and communities needed to develop their own models.

There was a need to demonstrate the value of e-democracy to citizens who in the West, largely didn't seem to care. "It's naive to expect people to suddenly get excited but reasonable to think that smaller, perhaps topical or local waves of adoption are achievable if communities can be motivated and supported."

His research suggested a basic social process of grounded leadership; people in both community and local government who could work together, motivate and inspire uptake of ICT, and engagement in democracy could bridge the different stakeholder groups and overcome inherent power structures and silos. "At the end of the day the most vulnerable are politicians – they have to get re-elected. In the UK, the 'They work for you' campaign is a brilliant example of holding our representatives to account, even though it doesn't directly change anything, it makes a start on keeping the system accountable."

Williamson was convinced e-democracy had some answers as long as the technocrats were kept out of the way. ICT had the potential to transform communities with its powerful tools for connecting people with information and each other .These tools were ideal for communicating a message and creating an interactive experience where the views of many could be expressed and potentially disseminated widely, offering citizens the opportunity to become more involved in the political and democratic process.

Getting it right he emphasised, was not simply about web enabling the same tired old processes. "They don't work. They don't engage. People are turning off from democracy because the process is run by consultants and bureaucrats. To reinvigorate this process we need to get people back at the centre – and who's most qualified to do this, bureaucrats or citizens?"

Actually, he said, the correct answer was both, working together and re-building trust and confidence in democracy. "The Internet can make the process transparent but this is a risk for civil servants used to secrecy and controlling the process." Equally, he said, the Internet can bring in many different views, and was a challenge for the single-issue fanatics that tend to drown out debate. "Most often the answer lies in the middle ground but this has been lost in democratic debate because these are the people who have switched off."

That's why, he said, e-democracy rather than simply e-enabling the status quo needed to be promoted on the streets, not just in council chambers. His answers included building power at the grassroots, making sure that everyone had access to computers, broadband and the skills to use them. "We look for what motivates people to get on-line. Then we help them to make democracy work like they want it to – make it work for them. We motivate each other, your neighbour is a better mentor than someone remote."[44]

In many ways we were still dealing with the underlying and basic issues of enablement. Without connectivity there would be little comfort or confidence in what we did with the content. Ernie Newman from TUANZ was convinced much more needed to be done to pull the country back from its current state of telecommunications crisis. "The real opportunities of the digital age are gigabitting past while we dither along at dial-up pace. Never before has our country fallen so far behind the rest of the developed world in our embracing of a new, life-changing technology."

What was needed, said Laurence Zwimpfer, was for bold people who had the backing of politicians, influential people in business and the community to step out of the crowd and take the Digital Strategy vision forward. While the government had consciously avoided backing winners in the past, it was time for all parties to share the risk of building the infrastructure for the future.[45]

Government needed to lift its game, particularly in the areas where it had the logical and democratic mandate; health, education, social welfare, and essential infrastructure. It must also remove the obstacles and provide incentives for businesses to do what they do best: innovate, employ, improve the skill base, lift GDP, and export excellence.

The bureaucratic mindset that launched visionary projects with huge potential national impact, then micro-managed them into policy frameworks, underfunded implementation, and became smugly satisfied with reports of potential outcomes was old-school thinking. The new mindset was to empower our visionaries rather than to sideline, or worse hijack and sanitise their ideas.

21

Broadband breakthrough

The battle to unbundle

> We're being out marketed, out smarted and outgunned in the marketplace…(we lack) the killer instinct; we are too tame, too lame, and too timid to call ourselves a challenger (we need to become) pre-meditated, cold blooded killers of our competition.
> TelstraClear CEO Alan Freeth's Christmas message to senior staff, 21 December 2006

For true interactivity, powerful real-time gaming experiences, videoconferencing and professional-level VoIP or voice-based services you need high-speed, robust Internet access and QoS, something only Telecom could provide prior to the wholesaling of raw Internet bandwidth.

Successive governments, either intimidated by our biggest company or blinkered by the contradiction of 'hands-off' regulation, in effect protected Telecom's right to maintain the bandwidth bottleneck. Because of this light-handed approach Telecom had continued to monopolise the local loop or 'last mile' of copper connections into businesses and homes, keeping competition at arm's length.

Reinvestment was at a low ebb; in fact Telecom's focus seemed to turn offshore with the 1999 acquisition of AAPT when its home turf was in desperate need of attention. It had dictated connection speeds and imposed data caps, preventing anyone other than itself from delivering Internet performance greater than 2Mbit/sec for downloading and 128kbit/sec for sending. It stated on many occasions it would only increase speeds when the market demanded, but even under a deafening roar of protest, continued to drip-feed services.

It had been a long-held belief in the industry that New Zealand's $5.3 billion telecommunications market, up from $3.6 billion in 1997, should be experiencing more robust growth. In 2006 Telecom was making about $2.4 billion from local service and calling revenues; only a few entrepreneurial players, including service and equipment providers, got to share the rest of the pie. Even its competitors, TelstraClear being the largest, ended up as its customers.

Unbundling had been spoken about for several years but was first raised as a serious option in late 2003, kicking Telecom's lobbying machine into overdrive. The full details of Telecom's political activism, however, had remained private until December 2005, when *The Press* made an Official Information Act request, revealing the contents of a letter written by Telecom CEO Theresa Gattung

to Minister of Communications Paul Swain in May 2004. She had warned him that 30 cents could be potentially wiped off Telecom's share price if unbundling was required. The letter reminded Swain that Telecom was the country's biggest company, comprising more than 20 percent of the sharemarket, and that the government superannuation fund was invested in it.

Gattung threatened Telecom would not invest in 'next generation' network upgrades for residential customers if TelstraClear got access to its network, urging Swain to accept the Telecommunication's Commissioner's watered-down proposal. The heavying worked – despite Swain and the MED supporting unbundling, this was overruled by Cabinet and the 'market-led solution' was chosen, essentially buying Telecom another year. TUANZ chief executive Ernie Newman said: "The suggestion ministers would favour one company in this way over the national interest almost suggests a banana republic."[1]

Business columnist Gareth Morgan was stunned at the revelation:

The revelation, prized out under the Official Information Act, that Gattung threatened the government with a collapse of the New Zealand sharemarket if local loop unbundling was permitted, is worrying. If such an outcome were true it confirms that through its Kiwi Share and special protection of Telecom, the government has created a monster that has infrastructure of national significance at its mercy … In this case a responsible and competent government would either trust-bust this outfit or, heaven forbid, renationalise it. There's only one thing more worrying than a legislated State monopoly, and that's a private one. Having naïve politicians shivering in their boots because the head of New Zealand's largest listed corporate spits the dummy over competitive consequences of deregulation reveals both particularly weak political leadership as well as Telecom exerting strong-arm tactics behind closed doors. That it's taken 18 months for this bludgeoning to come to light calls for Telecom's privileged access to government to be terminated…[2]

The same month as Telecom's closed-doors correspondence was disclosed it was revealed that Rosemary Howard, TelstraClear's CEO, had also been lobbying. She had written to Jim Anderton, MED, in April 2004 pointing out that the United States had lodged a complaint against Mexico for not unbundling and failing to meet telecommunications obligations under the General Agreement on Trade in Services (GATS) and the World Trade Organisation (WTO), which had ruled in favour of the United States. "I consider that New Zealand is also not meeting its GATS obligations. Accordingly, New Zealand is risking being found guilty of a breach, which would cause significant damage to our reputation."[3]

Howard also quoted a 2001 letter from the assistant for US trade representative for industry and trade to the New Zealand secretary of commerce, which said the United States believed local loop unbundling would be in line with New Zealand's commitments under the WTO's Basic Telecommunications Agreement. She said any free trade agreement between the United States and New Zealand would require unbundling. Australia's Trade Minister, Mark Vaile, did his bit for TelstraClear by writing to Jim Sutton, Minister of Trade Negotiations, to say that a decision not to unbundle the local loop would be contrary to the goal of Closer Economic Relations (CER) such as free trade in services. New Zealand trade officials advised their ministers that not unbundling would not breach WTO, GATS, or CER commitments.[4]

RAT CRASHES NET

The ongoing demand for better access to broadband wasn't just rhetoric being spouted by Telecom's competitors wanting a greater share of the pie; it was a cry from businesses who found the cost of moving increasingly rich content around the country or the world a major impediment to growth.

Despite the huge success of the *Lord of the Rings* trilogy, New Zealand's screen production industry was watching millions of dollars in business head offshore because it couldn't get access to high-speed data networks. The NZ Screen Council had asked the government for access to its new 'advanced network' because commercial carriers including Telecom and TelstraClear couldn't or wouldn't deliver the required services, resulting in lucrative contracts going to countries better equipped for the digital future. Film makers in Los Angeles, for example, were keen to use digital effects houses in New Zealand but the network capability wasn't available to enable the exchange of such data; 30 seconds of film could easily equate to 720Mb. Both Telecom and TelstraClear were charging by the megabyte and Telecom's cost was $95 a Gigabyte, which was described by one potential customer as 'outrageous.'[5]

Cost of access to bandwidth for everyday broadband right through to high-end use was a major issue if the country hoped to compete internationally. However the state of the Telecom network, and our reliance on it as essential infrastructure, was brought sharply into focus at the end of June 2005, when, as *NZ Herald* technology writer Peter Nowak explained, the 'unthinkable' happened:

> *New Zealand was brought to its knees not by crazed terrorists or an unstoppable force of nature but by a lowly rat and an errant post digger. Although the sequence of events that crippled the country's telecommunications system for the better part of a day was unlikely – "freakish" and "one in a million" – the events were enough to give pause on the state of the infrastructure and its owner, Telecom. On Monday morning rats chewed through cables going over a bridge in the Rimutaka Ranges. Telecommunications services immediately defaulted without disruption to Telecom's main western pipeline, until a Powerco post digger hit it at 10.48 a.m. With both main pipes damaged, services went down for the next four and a half hours. The damage was widespread as mobile phones, Internet services and Eftpos were knocked out. Landlines were jammed with callers wanting to know what was happening … About 100,000 customers nationwide were affected.*[6]

Ironically Telecommunications Minister David Cunliffe praised Telecom for its quick action in getting things sorted and Telecom was quick to defend itself, saying it used world best practice in burying and protecting its cables. It said it couldn't do anything about the rats, chastised Powerco for not checking where the cables were first, and promised that ongoing upgrades would provide five extra switching points to minimise the likelihood of such an outage ever happening again. Still, questions were asked about why Telecom had been under-investing in its network and why it had taken a crisis like this to bring such vulnerabilities to the surface?

WE PROMISE TO BE GOOD

Telecom had inflated its broadband figures by including 128kbit/sec speeds when the global consensus was a minimum of 256kbit/sec, and in most cases 2Mbit/sec. It took until mid-2004 for it to revise the minimum broadband specification. Despite industry pressure to unbundle, newly appointed Telecommunications Commissioner Douglas Webb, under instructions from Cabinet, had decided to give Telecom another chance. Instead the Commerce Commission delivered an ultimatum that it must connect 250,000 new broadband customers by the end of 2005 or face regulation. A third of those customers (83,333) had to come from wholesaling to other ISPs.[7] At the time of the undertaking only 15 percent of Telecom's broadband customers were coming through wholesale.

It remained obstinately opposed to any suggestion of unbundling, even as the government-imposed deadline loomed. The Commerce Commission's long-awaited unbundled bitstream service (UBS) determination, based on a complaint laid by TelstraClear, roundly rejected Telecom's concerns about the dangers of delivering 'unconstrained broadband' to wholesale customers. In October 2005

the Commission said Telecom should provide UBS customers with DSL that had 'a downstream peak information rate (PIR) at the maximum technical capacity possible.' That rate was determined at around 7.6Mbit/sec based on the DSL equipment Telecom used. This was a departure from an earlier recommendation of 3.5Mbit/sec.

Telecom warned that providing such an unconstrained service would pose a risk to existing customers through increased signal noise in the cable sheaths, despite having delivered such a service to its own customers since 1999. The Commission was confident the new specifications were unlikely to create further risks. It also said there was no justification for Telecom charging different wholesale rates for business and residential UBS, as there was no material difference between what it was offering TelstraClear and what it used itself. It said Telecom must therefore offer TelstraClear a single, uniform wholesale rate for both business and residential UBS. While it had dropped its controversial 'churn' fee, charged when customers switched to another provider from $110 to $36.42, the Commission said a figure closer to $8 would be more reasonable. It expected Telecom to have the new regulated UBS ready before the end of 2005.

Telecom's manager for government relations and industry affairs, Bruce Parkes, restated his concerns that unrestrained broadband would significantly impact on its ability to service customers a long distance from exchanges. He said up to 72,000 customers in rural and urban areas would be affected but obviously the Commission had decided those risk were outweighed by the need to increase competition.[8] The promised delivery remained difficult. Telecom filed for a judicial review of the Telecommunications Commissioner's draft wholesale ruling, concurrently announcing it would not be meeting the voluntary target of 250,000 wholesale broadband subscribers promised in 2004. It lamely argued it understood the goal to have been 50,000 wholesale connections, or a third of its total growth over the period. It had missed the target by 20,000.

Rather than prolong the debate TelstraClear, eager to have access to Telecom's network at average retail prices less a suitable margin, caved in to a 3.5Mbit/sec compromise in December 2005. The new deal was immediately passed on to Telecom high-end account holders who were upgraded from 2Mbit/sec to 3.5Mbit/sec download speeds. The controversial upload speed remained at 128kbit/sec unless you were a premium account holder paying $80–$100 a month, in which case you would get 512kbit/sec upload speeds.[9]

In January 2006 Telecom and TelstraClear agreed on interconnection rates for phone access to each other's landline networks. Telecom agreed to provide limited broadband services to TelstraClear and pay it a one-off $17.5 million to settle several issues, mainly backdating the agreements on wholesale discounts and interconnection. Both agreed to drop multiple legal actions that had been used to delay and obstruct the other. "The worst part of the deal is that Telecom's odious and arbitrary crippling of the upstream speed of broadband connections remains in place," opined *Listener* columnist Russell Brown in his review of the situation.[10]

The industry was incensed. Having done its backroom deal, Telecom presented remaining ISPs with a take-it-or-leave-it offer on wholesale broadband rates. Ihug and Slingshot applied to the Commerce Commission for equal access to broadband at higher speeds with Slingshot's CEO Annette Presley describing the wholesale offering as 'bullshit.' "It costs more, the speeds are slower, and they can't guarantee quality of service. How can we put that to our customers?"[11]

GAMEKEEPER AND POACHER

Prime Minister Helen Clark had warned in a February 2006 parliamentary speech that New Zealand's speed of broadband uptake was unsatisfactory and improving the situation would be one of the government's top three priorities. She promised urgent legislative initiatives to deliver 'faster Internet

access and at more competitive prices.'[12] No one could say Telecom wasn't warned. Its endless tactics to keep prices high and speeds low, and its rapid response to defend its patch by placing obstacles in the way of competitors were legend.

As part of its 2006 election promises, the government placed increasing pressure on Telecom to improve its record in providing faster wholesale services to ISPs, aiming to shift the average cost of an account to a dollar a day or $30 a month rather than the market average of $40. The price point was considered an important psychological barrier for uptake.[13] It was the government's stated intention to get the country into the top quarter of the OECD Broadband Statistics listing; since 2003 it had languished at 22nd place out of 30 nations.

Our level of fast Internet access – 256kbit/sec plus – had lifted only marginally from 4.5 percent to 6.9 percent of users in the year to June 2005. To reach the government's goal by 2010, about 80 percent of residences or 600,000 customers would need to be connected to broadband – the equivalent of a 300 percent growth spurt over the next five years. "These statistics pose a challenge to the industry and the government. Telcos, ISPs and the government need to lift their game if we're ever going to gain the benefits that widespread access to high quality, affordable broadband will bring," lamented InternetNZ president Colin Jackson.

The number of broadband subscribers throughout the OECD continued to increase in 2005 from 136 million in June to 158 million by December with growth holding steady at 15 percent, compared to New Zealand's dire 8 percent. An April 2006 analysis of 87 providers in the 30 OECD countries found bundled video, voice and Internet access were available from 48 providers in 23 countries by September 2005. So-called 'quad-play' (voice, Internet, movies, and mobile voice) was available in 10 OECD countries. The challenge for developed nations had been to create a legal framework for LLU without getting in the way of innovation or disadvantaging competitors. In 2006 New Zealand remained one of the few OECD nations, alongside Mexico and Switzerland, yet to legislate for unbundling.

Telecom had continued to play gamekeeper and poacher, all but ignoring ministerial threats to play fair or face legislative changes. Then Telecom CEO Theresa Gattung called David Cunliffe's bluff when he threatened regulation. Addressing business analysts in Sydney in March 2006, she said the government was far too smart to 'do anything dumb' like unbundling; suggesting the broadband issue was just a 'manufactured grievance' created by competitors.

> *Think about pricing. What has every telco in the world done in the past? It's used confusion as its chief marketing tool. And that's fine. You could argue that that's how all of us keep calling prices up and get those revenues. High-margin businesses keep them going a lot longer than would have been the case. But customers know that's what the game has been. They know we're not being straight up.*[14]

In a last-ditch attempt to stave off regulation, Gattung had written to David Cunliffe in April offering to accelerate the company's investment in broadband infrastructure by spending 'hundreds of millions of dollars' rolling out fibre-optic cable to almost all small towns by 2010. The offer was rejected and in a backlash Telecom said it would scale back its ambitions by extending its fibre network in the five main centres of Wellington, Auckland, Christchurch, Hamilton, and Dunedin only.[15]

When you fail to take your foot off a high-pressure hose, it's inevitable there will be a leak. That leak, delivered by rogue parliamentary messenger Michael Ryan into the hands of a senior Telecom employee on 3 May 2006, proved the government was indeed serious. A budget announcement was planned to bring New Zealand in line with 26 other OECD nations by legislating for LLU along with other proposed changes to telecommunications regulation.

Once the news got out, it shaved at least a billion dollars off Telecom's share index and while those shares quickly bounced back, Telecom was forced to rethink what it meant to operate in the unconstrained market promised to the country for nearly 20 years. By the time the audio tape of Gattung's unfortunate outburst reached the media the government had already acted. Pressured from all sides to open up faster and more affordable Internet access, it administered the first of a series of enemas to Telecom in May 2006 in the hope of relieving New Zealand's communications constipation.

LLU would proceed and legislation was drafted with strong measures to ensure Telecom followed through. Within weeks the Telecommunications Amendment Bill was sent to Parliament with Cunliffe warning that further measures might be on the way, possibly even a forced split of Telecom into separate retail and lines companies, Meantime Telecom would be required to open up its books and technology roadmap, and separate out its wholesale and retail divisions so the Commerce Commission could monitor its compliance. Telecom would be required by law to allow its rivals to install their equipment at its exchanges. The government also insisted the existing 128kbit/sec cap on upload speeds would have to go.

The bill extended the powers of the Commerce Commission to regulate the telecommunications sector with a new civil enforcement regime, with fines up to $1 million for a breach of the accounting separation requirements and $300,000 in any other cases. Cunliffe also asked the select committee to seek submissions on operational and physical separation options for Telecom.

The government would also renegotiate the Kiwi Share (TSO) as an incentive to improve broadband access in rural areas. It hinted there might also be action to prevent Telecom starting price wars to keep its customers. Strong intervention in the telecommunications market would, we were led to believe, literally kick start a new era of competition. However as several people pointed out, the devil was in the details and it was imperative for the industry and broadband customers that the technical and commercial framework of the legislation was rock solid and unambiguous.

OUTAGE EXPOSES ATTITUDE

Telecom's market value of $12 billion in 2005 dropped sharply to $8.8 billion in May 2006 following the unbundling announcement, but it remained in a good position for a rapid recovery. It announced $806 million tax paid profit for the 2005–2006 year. It had invested $585 million back into its network and systems and expected to spend $610 million in 2006–2007. This was part of the ongoing $1.4 billion investment in the NGN platform, designed for more efficient delivery of voice, data, and all forms of multimedia content.

Telecom was determined to remain highly geared for long-term profitability regardless of any legislative changes. It even appeared repentant; or at the very least was revising its public persona, as the nice, friendly, helpful telephone company. In an address to TUANZ Gattung insisted Telecom was committed to a fair game, and not going to be obstructive, attempt to turn back time, mount rear-guard action or hide behind legalistic actions. It would act swiftly, she said, to come up with invigorating wholesale arrangements, and true to Telecom's glossy charter would provide a consistent service delivery experience for everyone concerned, launch new intermediate products and offer greater transparency and communication.

Most ISPs, and others keen to invest in the new network environment, were watching one thing, whether Telecom would affirm this new attitude with action. Within days of the government's LLU announcement Telecom's Xtra network faced a series of intermittent Internet and email outages. This was blamed on 'a fault with a power supply,' then 'a faulty load balancer' and other unstated issues.

Despite claims all customers were back on line, many were still having problems over the following week. A customer service spokesperson explained outages were a fact of life on the Internet, which was itself 'a best efforts' service. "ISPs can't guarantee a continuous uninterrupted service," said customer services manager, Kelly Moore. That statement alone raised a few eyebrows.

By the end of May, Telecom's gracious offer to refund affected customers with the equivalent of four days' access – an estimated $3.25 per customer – was exposed as another 'bah humbug' effort. It sent an email to its 600,000 Xtra broadband and dial-up customers apologising for the outage and asking them to prove they were eligible for the refund. A spokesman estimated about 90,000 customers might qualify, but couldn't resist complaining that this would potentially cost it around $300,000. There was no mention of the thousands of dollars in lost business and the major inconvenience some customers were still facing weeks after the so-called four-day outage.

Then ISPs received notification from Telecom that it would be enforcing 'an average aggregate data limit per customer' and charging a premium if overall upload traffic exceeded a specified monthly data cap. While this provision had been in the small print since 2004 it hadn't been enforced until now. Ihug, which had been offering free upload speeds on most of its accounts, would have to add upload costs to customers' download data caps from 1 July. Incensed at the move, it asked the government to exclude such charges in the new regulations.

IN THE BROADBAND BASEMENT

New Zealand remained a digital ditherer, down in the bottom quarter of the OECD's broadband penetration statistics. By the June 2005 OECD broadband report we'd lifted our game only marginally to 4.5 percent or 191,695 users for the year to December 2004. The OECD average was 10.3 users per 100. By the 2006 report there we were again in 22nd place for the fourth year running, a dire position confirmed in an independent survey by InternetNZ.

Only 11.7 percent of New Zealanders, about 479,000, were connected to the Internet at high speed, slightly higher than the 8 percent penetration of December 2005. The OECD average was now 15.5 connections per 100 inhabitants.

While New Zealand's Internet access cost was considered reasonable, restrictive data caps had limited the effectiveness of high speed access. We were only saved from being the compost at the bottom of the heap by the move to free up wholesale 3.5Mbit/sec speeds. A total of 2586 residential and business broadband packages from 388 ISPs in 26 countries were analysed in the InternetNZ survey, with data from early May 2006 confirming we were indeed ranked 22nd. We had more data caps than any other country and less choice for broadband access than Australia, Ireland, and Britain. Our low upload speeds also came in for criticism.

As an ICT nation we were ranked by the annual IDC Information Society Index at number 17 of 53 countries in 2005, but when our low levels of broadband were taken into account we slipped back to 28. Australia was in seventh place, the United States at 13, and United Kingdom at 19. The Information Society Index combined a country's ranking across computing, telecommunications, Internet, and social aspects. The index was based on the number of Web users, e-commerce maturity, home and mobile Web users. Again the not-so-magic number 22.

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Earlier in May, the 2006 World Competitiveness Scoreboard of 61 national and regional economies saw New Zealand fall from place 16 to, you guessed it: 22nd, with the footnote 'must improve broadband.' All of this made a sham of the government's goal to have us in the top quarter of the OECD figures by 2007 and Digital Strategy promises to have 5Mbit/sec DSL available across the country by the same deadline, possibly soaring to 50Mbit/sec by 2010. David Cunliffe agreed we were at real risk of being left behind. "No broadband means no play. Do not pass 'go.' Do not collect a first world income. Do not expect the next generation of the best and brightest to live in New Zealand."[16]

THE MEGABYTE SQUEEZE

In keeping the market to itself Telecom had not only made it uneconomical for competitors to wholesale services from its network, it had kept such tight data caps on accounts that ISPs and their customers had to pay a huge premium if they were to stream or download significant amounts of music, film, or rich data. In 2005 most ISPs couldn't get 2Mbit/sec download speeds from Telecom and were restricted to upload speeds of 128kbit/sec. By May 2006 many Telecom Xtra customers had their accounts upgraded to 3.5Mbit/sec speeds. There were an estimated 300,000 broadband subscribers, around 8 percent of the population, including 100,000 customers outside of Telecom's Xtra network, many now operating at 2Mbit/sec with the hope of much greater things on the horizon.[17]

At the end of May, CallPlus and Ihug, motivated by the fact TelstraClear had struck what amounted to an in-house deal, were now were leading the charge for (UBS access. They believed the Commerce Commission should now deliver on its original promise of 7.5Mbit/sec, opening the way for faster sub-$30 broadband accounts. By June they had their wish. The Commerce Commission granted CallPlus and Ihug wholesale access to the fastest broadband that Telecom could provide. However this was at a price slightly higher than TelstraClear. The Commission also made a ruling to uphold Vodafone's application to interconnect with Telecom's network. It ruled Vodafone had the right to use a mobile as an option for a landline service, that neither party could charge each other to receive local calls and Telecom could not charge its customers a higher price to call a Vodafone phone.

Speedy launch. CEO Allan Freeth launching TelstraClear's Pretty Damn Quick (PDQ) Broadband in July 2006. Photo: TelstraClear.

ISPs, industry groups and government officials were eager to chart the way forward and hammer out the specifics of the new environment. InternetNZ, ISPANZ, TUANZ, Orcon, Ihug, CallPlus, and others, deeply concerned about the outcome of the LLU decision, were engaged in a round of meetings with each other, with ministers, bureaucrats, the MED, Commerce Commission, and the Telecommunications Commissioner. The industry had never been so organised, motivated, vocal, and determined to have its way. There was general agreement that the future framework for competition needed to be foolproof and futureproof. Certainly the right balance had to be struck

and this was being clearly articulated in submissions on the Telecommunications Bill. If legislation was too prescriptive and literal it might limit access to smarter next generation technologies, and scare off potential investors. If it was too loose it might need to be revisited within three years and result in the kind of legal wrangles over detail that squashed competition in the first place.

As ISPANZ vice president Scott Bartlett said, the real battle had just begun. While ISPs now had LLU in theory, they needed to sort out access charges, backhaul charges, rack design, tenancy costs and third party access; and that was just the big ticket stuff. The legislation needed lots of detail, particularly in empowering the Commerce Commission to make rulings, otherwise it could take several years to sort out the mess. "Making LLU work for everyone is important, the more people we have singing from the same song sheet the better."

Bartlett voiced widespread concern about the price for access to the copper tails into homes and business. "If it's not economically viable no one will benefit." And he didn't believe there was room for every ISP to start putting their DSLAMS on the Telecom network. "We're still a small market with relatively low uptake of broadband and I don't think there's room for four or five new networks. If we start getting independent networks throughout the country it would be such a waste." ISPs needed to work together, perhaps using 'port credits' as a way to ease the burden of investment and broaden coverage. If someone built a network in Christchurch and another company built in Auckland they could offer port credits on each other's networks.

CYBER TILLS RINGING

Consumer e-commerce took a while to get established as a mainstream option in New Zealand, largely because retailers had been scared off from major investment through the failure of pioneering on-line superstores. By 2005 the shadow was lifting and while local shoppers still loved offshore bargains delivery costs were a turn off. At home on-line banking had boosted confidence, technology had begun to mature and all the signs were in place for a local e-shopping boom.

Overseas trends revealed 2005 as a watershed year for on-line sales. In Britain, 24 million consumers spent NZ$13 billion on-line in the 10 weeks before Christmas. In the more mature US market, people bought on-line in record numbers. By December 2005 on-line retail sales had reached $US17 billion, up 24 percent on 2004.[18] By the end of 2006 New Zealand retail spending was estimated at about $60 billion but only about 0.3 percent of this was being transacted on-line compared with around 10 percent for Britain and 5–7 percent in the United States.[19]

Most major business now had some form of Web access and there were a growing number of sites able to provide a full retail experience but there were few mega-sites offering to bring the entire shopping experience together. Telecom tried to fill that space by launching its Ferrit on-line shopping portal in mid-July 2005 after finally acquiring the domain from a former host of pornography. Despite a marketing budget of $15 million, the site's debut was unspectacular and according to statistics, Web surfers hardly paid it much attention in the early days, with around 3000 hits a day in January 2007 compared with TradeMe's 284,000.

The goal in phase one of Ferrit's life was modest: expanding the number of retailers and products searchable on the site. By February 170 merchants had joined and several hundred more had

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shown an interest. Sales queries were automatically referred to a retailer's web site, but ultimately purchases would be directly made through Ferrit.[20]

That step up to a full-scale e-commerce operator came in time for what Ferrit hoped would be the Christmas rush, with widespread television advertising pushing the revamped site. Around 90 retailers were using Ferrit's new shopping cart system to buy directly from retailers and pay by credit card. Previously the site simply directed customers to retailers' own web sites. Ferrit was nowhere near break even and while many believed New Zealand was on the verge of an on-line retail boom, many were still wondering whether it had the formula right. Nielsen NetRatings estimated Ferrit had around 172,000 unique users in November but market analysts believed it should be attracting many more visitors, based on the marketing investment.[21]

New Zealand's biggest on-line success story by miles was Internet auction site TradeMe and it was no surprise when Fairfax Holdings fronted up with $700 million in cash to acquire it in March 2006. An additional sweetener of $50 million would be paid if the company met certain earnings targets over the next two years.

Sam Morgan founded TradeMe in 1999 at the age of 23. It rapidly became the country's most visited web site, with 1.2 million members who were expected to run 35 million auctions in 2006.[22]

ACNielsen said 1.265 million people had made purchases on-line to December 2006, spending around $1.5 billion. Of those 423,000 or 33 percent were regular on-line shoppers. This compared with 239,000 regular on-line shoppers in 2001. New Zealand's on-line shopping figures were up at Christmas 2006 in line

Nielsen//NetRatings
www.nielsen-online.com

TOP ONLINE SHOPPING CHRISTMAS GIFTS
% of shoppers intending to purchase Christmas gifts online in 2007

1	Clothing	43%
2	Books	41%
3	Toys	37%
4	Gift voucher	34%
5	Beauty products	32%
6	Perfume	26%
7	Gift basket	24%
8	Clothing accessories	22%
9	CDs/records/tapes	21%
10	Jewellery	20%

Source Nielsen Online - NZ Online Retail Monitor November 2007
Top Online Shopping Christmas Gifts
% of Respondents, Sample Size 1,013

The on-line world looked set for mainstream activity at the close of 2007 with shoppers and advertisers showing much greater confidence than any time previously. The Interactive Advertising Bureau (IAB) said $40 million was spent in on-line advertising in the third quarter of 2007, up 23 percent quarter on quarter. Total ad spend for the first nine months of the year was just under $100 million. Meanwhile Nielsen//NetRatings' On-line Retail Monitor monthly tracker for November 2007 expected a dramatic spike in intended gift purchases on-line for the festive season compared with actual purchases for September. Of those surveyed 43 percent expected to buy clothing (13 %), books 41 percent (up from 9%), toys 37 percent (up from 7%), beauty products 32 percent (8%), non-downloaded music 21 percent (5%) and jewellery 20 percent (5%).

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with world trends. Nielsen NetRatings senior analyst Jennifer Reddington said about quarter of New Zealanders had purchased something on-line during 2005, and the number of on-line shoppers had increased consistently over the previous two years. "People are getting more comfortable conducting commerce on-line, and anything the retailers can do to boost people's confidence is obviously going to help drive the market."

TradeMe reported a stronger increase in activity than usual over the Christmas period, particularly in January where people were re-gifting unwanted Christmas presents. Telecom had launched Ferrit at the end of November 2005 and expected between 50,000 and 60,000 visitors over the Christmas period. Instead it had more than 100,000 visitors in the lead-up to Christmas. About 170 retailers had signed up for the shopping site, the top selling categories being electronics, apparel, whiteware, DVDs, CDs, and clothing. US figures showed an increase of 25 percent over 2005 with shoppers spending US$25 billion (NZ$36 billion) between the end of October and December 16.[23]

TELECOM READS TEA LEAVES

The dilemma remained whether unbundling alone would be enough to energise the market into a new era of rapid broadband growth. With a foot now in the door there was talk the market needed to be opened up further and overseen by a regulator who was more than a paper tiger. In fact InternetNZ executive director Keith Davidson wanted to see the incumbent make solid progress on voluntary structural separation. In other words he wanted Telecom to put forward its own plans for restructuring into wholesale and retail divisions and to begin negotiations with UBS wholesalers as soon as possible.

The Internet lobby group wanted an immediate improvement in broadband packages including faster upload speeds, neutral peering for Internet traffic between service providers, and the elimination of churn fees and installation delays. In short it wanted to see a transformation from Internet-delivered, Telecom-configured services and products to an era of open access end-to-end connectivity.

Telecom quickly 'read the tea leaves'[24] and publicly stated its commitment to supporting the new regulatory environment. Rather than waiting for the government to determine the conditions of any split, it made a pre-emptive move, offering a form of operational separation in the hope of influencing the impending regulatory environment. Just as the draft legislation was tabled in Parliament, Telecom announced that its wholesale operation would run as a physically separated business. Information flows between wholesale and retail divisions would be strictly controlled and there would be a series of public, legally binding undertakings on service delivery, and transparency, monitored by an independent oversight group.

The concept was not unfamiliar to Telecom, which had entered into 'voluntary separation' when it was first deregulated in 1989. Two years later it reconsolidated after its sale to Ameritech and Bell Atlantic. This time it favoured the British Telecom model, customised for the New Zealand environment. "There is a difficult balance to strike here. We need to both respond positively to the demands of the new environment and serve the interests of shareholders. We recognise shareholders need to earn appropriate returns over large-scale investment decisions. We believe the separation model we are currently introducing will meet the needs and expectations of key stakeholders and level the playing

field for all participants – while at the same time supporting the right incentives for further infrastructure investment in the industry," said a statement in Telecom's 2006 Annual Report.

Since the government announcement, Telecom had forced a friendlier face but its competitors were understandably wary about how the LLU process would play out, in particular how the incumbent who fought so hard to keep them at bay would treat their demands for equal access to the loop. The potential obstacles were legion.

At the very least competitors would need access to Telecom exchanges to co-locate their DSLAMs. Would there suddenly be a claim that there was no room in Telecom cabinets for co-location of equipment? If alternative cabinets were required would Telecom oppose this through the Resource Management Act (RMA)? Would local authorities allow the RMA to become an obstacle? Would competitors need a separate door to Telecom exchanges? Could they have access without a Telecom person being present? Did each exchange need a partition between competing provider's equipment? Would ISPs need to provide their own power and air conditioning? If the latest DSLAMs cost only $45 per port would it be fair for Telecom to charge $150 installation fees? Would Telecom avoid doing anything to help its competitors until legislation forced its hand or would it begin offering more attractive deals in the interim to prevent customer churn before LLU ground zero, sometime in 2008?

There was also the question of Telecom's connection ratio and the quality of service it might be able to offer. In other words how many users could share a single broadband link? British Telecom had a ratio of 50:1 for home users and 20:1 for business lines. It was alleged in some quarters that Telecom's ratio could be as high as 140:1.

Another obstacle facing new competitors was a significant shortage of technicians, engineers and customer service people who had skills in installation and maintenance and network repairs. Telecom had exclusive contracts with Downer and Transfield and TelstraClear had a deal with Cabletalk to look after its networks. The other major player, GDC, had gone belly up earlier in 2006. Perhaps third parties would have to sub-contract Telecom's contractors to install their equipment on the network? In the meantime, there hadn't been a lot of industry training and many of our best engineers and technicians had been lured overseas by lucrative contracts, further reducing the skills pool. No one could know with any certainty what the new environment would look like until the real turf wars began, access was opened to the last mile and full disclosure provided to Telecom's new wholesale customer-competitors.[25]

PEER PRESSURE INTERNET TRAFFIC COP

The concept of peering is essentially a meeting of equals on neutral territory to achieve a common good. In relation to the Internet the term describes peer-to-peer networking based on agreed points for exchanging data to ensure traffic gets to its destination the most efficient way, rather than heading off to the United States or the other end of the country when its real destination is across the street.

It is the nature of the Internet that such circuitous routes are not only possible but frequently occur without the right agreements and infrastructure in place between carriers and ISPs. Peering has traditionally involved carriers and ISPs paying a general fee to locate their own equipment at a central point, and exchanging data between their networks without charging each other.

It is also common practice for content providers to peer; for example, at the Wellington Internet Exchange (WIX) providers including news media

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site Stuff, TradeMe, and Radio New Zealand connect to peering ISPs. Peering works in very well with Anycast technology to dramatically improve the distribution of content across geographic areas. This means multiple locations have the same IP address, so the content can be drawn from the closest source. For example, Radio New Zealand uses Anycast to efficiently deliver its programming from regional servers located at peering exchanges.[46]

By peering, ISPs agree to provide routing information about their network to other exchange participants to optimise traffic flows. Currently there are exchanges operated by APE, Palmerston North (PNIX), WIX, the 3 Cities Internet exchange (3CIX), NZ IPv6 Internet Exchange, Dunedin Peering Exchange (DPE), Christchurch (CHIX), and one planned in Southland (SIX).[47]

INTERNET INTERCHANGE

The first pseudo Internet Exchange where ISPs could peer and exchange traffic was on the ground floor of the Computer Science Department of Waikato University. NZIX was the end point for the NZGate international access gateway, which was moved across to Telecom in 1996 but remained independently operated. The equipment was owned by the various exchange participants. It ran a range of protocols including older ones that had been required to support the Tuianet operations of the universities.

The first serious talk about the need for an external two-way Internet exchange came after a server in Los Angeles went down causing a major crash of the international gateway at Waikato in 1995 because there was nowhere else for the traffic to go. Additional DNS were added to the backbone and Telecom-owned network provider Netway promised to increase its own redundancy. Traffic was often routed offshore before it reached its destination in the next city or went through Waikato when it was meant for the business directly across the road. In other words a lot of traffic was taking an unnecessarily long journey to get to its destination, a term known as tromboning in the Internet community.

Exchanges kept local traffic within a city where bandwidth was cheaper and provided redundant paths so there was no single point of failure. Former ISOCNZ chairman Jim Higgins said a new DNS would ensure there would always be somewhere to resolve addressing. The DNS, 'the heart of the Internet' turns Internet names into numbers so the various servers know where to send mail. He was confident the proposal to establish an Internet exchange in Auckland would result in 'something sensible happening,' although he warned there would be a cost involved which could be passed on to the end-user.[48]

There had been backdoor paths between ISPs in Auckland for some time and several larger companies had alternative international routes. A consortium of Internet Prolink, the Iconz and KCBBS had established virtual links to keep local traffic local. Internet Prolink director Craig Anderson was concerned virtual exchanges would become too expensive and unmanageable. "Everyone would prefer a real exchange, managed by an independent body in a basement somewhere in downtown Auckland. That way each ISP would only need one link."[49]

Initially telecommunications market rivals Clear, Telstra, and Netway Communications were looking at ways

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to link each other's networks in the hope of providing more efficient routing of Internet traffic. They had regular meetings to try to agree on some kind of 'bridge' – either direct links or stand-alone exchanges. Telecom saw the move as an Auckland solution, while the other two parties saw it as a trial that could end up in a nationwide approach to routing between Internet providers.

APE IN SKYTOWER

The WIX opened in 1998 and the APE located on Auckland's Skytower came into play in 1999. Once these peering points were in play the bilateral agreements between Clear, Telecom and others started to multiply. NZIX at Waikato was overtaken by the Auckland and Wellington public exchanges around mid-2001 and fully decommissioned at 10.45 a.m. on 26 August 2002. It was dismantled an hour later without leaving any physical evidence of existence. The last router was a Cisco 4000 series router, owned by Netway Services.[50]

CityLink in Wellington had set the peering pace. The pioneering gigabit capacity metropolitan network, established by Capital Holdings, a joint venture between the WCC and 20 shareholders including Clear, Saturn, and INL, had established an open fibre network around the Wellington CBD late in 1995.

Writer and technologist Richard Hulse explained the evolution of what became WIX:

In 1998, CityLink started work on deploying a BGP/4-based Internet exchange on top of the public Ethernet. One of the key design criteria was a low cost of entry. So the CityLink team took a step back and looked at the exchange problem from a logical point of view: What were the core requirements of an exchange, and how could they use the existing fibre infrastructure to create an environment that would encourage as many people as possible to join?

A key component of CityLink's approach involved placing routers at a customer's point of connection to the fibre infrastructure rather than in a central location. Because the exchange was distributed, CityLink needed a low-cost mechanism to allow people to peer, and so they started using Zebra on Linux as an alternative routing platform to Cisco … In addition to devolving hardware to client's premises, the routing tables for the whole exchange were managed by way of route servers. The new exchange was dubbed WIX, the Wellington Internet Exchange. There was a fixed monthly charge for connection, but traffic over the fibre network was free. Because the network often runs right past a potential user's door, it is easy for anyone to connect and peer. And this is exactly what has happened – even end users who could never peer under a traditional model now could. For all exchange users, access to the global Internet still necessitates the purchase of "transit" access to the global Internet routing table – from at least one ISP.

The open peering approach made a huge impact on traffic flows and latency. When the Internet first started in New Zealand, the country's single exchange point, at Waikato University, was also the international gateway for the whole country. Two businesses in Wellington wanting to exchange data would send it to their respective ISPs, who sent it upstream to Waikato. The path time for this typically ran 50–200 milliseconds (ms). When ISPs began to exchange data directly in Wellington, this rate dropped

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to 20ms. End-user peering reduced this by another factor of ten, to 2ms. In addition to shorter and faster network paths, no charges were levied for traffic sent over CityLink by way of the exchange. ISPs never see the traffic, because the exchange directs it through the shortest path to the requesting party. A number of printing companies were peering at WIX and exchanged huge publishing files at no cost. One local newspaper ran an FTP server on WIX to which pre-press companies could upload files. Some graphics houses also ran media stores for their clients, and these could be browsed at no cost, as though they were part of the client's own LAN.

The distributed exchange environment has been likened to a market square, where anyone could trade their wares at no cost. Not everyone chooses to peer openly though, and the exchange supports all types of participation. A number of ISPs exchange traffic only with established customers and ignore any other traffic. Some simply use WIX as a neutral point to exchange data with one other party. By 2005, 130 entities are peering at WIX, with close to 1000 using the CityLink fibre for private purposes or public Internet connectivity.[51]

TELSTRACLEAR EXITS Xs

Things ticked along quite nicely for a time with all parties acting rather chummy about the mutual sharing arrangements but then peering came back into focus in a big way when TelstraClear decided in November 2004 that it wanted to start charging to exchange traffic with other parties. Both TelstraSaturn and Clear Communications had openly participated in the shared arrangement and in fact were instrumental in setting them up. Now it seemed TelstraClear was unhappy about the underlying costs of interconnection, even intimating that the smaller ISPs had been getting a bit of a free ride. It discontinued peering from WIX and APE.

Maxnet and others wondered what all the fuss was about. It paid for a connection into the Auckland exchange and CityLink took responsibility for the actual handover of traffic. It wasn't as if Maxnet had more traffic passing through TelstraClear than was coming back its way; the flow was about even. It concluded the big carrier must have been driven by financial motives. The fallout was immediate with high hit rate web sites including TradeMe receiving triple their normal bandwidth bills because customers had to access the site in a more circuitous route than previously. Some end users were also noticing a jump in their monthly accounts.[52]

TelstraClear's de-peering was closely followed by Telecom's, which also detached itself from arrangements with WIX, causing an uproar in the ISP community. TradeMe was forced to cut a deal directly with the big carriers to access their ISP customers and a number of other larger content providers followed suit.

Some New Zealand providers were already 'keeping local traffic local' at peering exchanges in Auckland, Wellington, Palmerston North, and Dunedin. However the two major telcos had for three years favoured commercial agreements, where other providers paid them to send traffic into their networks. The de-peering situation had led to New Zealand–bound traffic 'tromboning' to Australia and the United States.

ISPANZ president at the time, David Diprose, said local data should be exchanged locally and exchanging local data internationally was nonsense.

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"Lack of local or regional data exchanges and the resultant 'tromboning' of data overseas is unacceptable." Peering was key to the future of Internet connectivity in New Zealand and enhanced the structure of the Internet 'through resilience, diversity and economic efficiency.' If the telcos recognised the value of local data exchange, this would resolve some of their own national and international capacity issues, he claimed.

That provoked chastisement from TelstraClear. Spokesperson Mat Bolland said the two largest telecommunications companies invested heavily in New Zealand and if ISPs were not happy with the service they received they should look elsewhere. The price for broadband in the market was much cheaper for customers than it used to be. "Not-peering keeps it simple for us and simple for the consumer."[53] Telecom then jumped into the deep end of the debate, obviously keen to distance itself from TelstraClear's comments. Telecom Wholesale spokesperson Melanie Marshall said Telecom was reconsidering local peering. Telecom Wholesale has been investigating local Internet interconnection against the background of LLU the arrival of new networks including the MUSH roll-outs and the possibility of more regionalisation of service delivery. "While supporting the idea that local traffic should not unnecessarily be routed outside the local area for distant handover to another network … parties should be free to choose which service attribute best meets their business objectives and budget."[54]

ROUNDTRIP COSTS ESCALATE

Hi-tech entrepreneur and software developer Rod Drury was concerned the actions by the major players put our economy at risk. In his discussion paper 'Securing Our Digital Trade Routes,' he expressed his frustration at the lack of action on broadband access and suggested the government step in and create a state-owned fibre network open to all parties and charged on a cost-plus basis. Peering would be managed by a carrier-neutral body.

The lack of peering in New Zealand since 2004, he said, was costing the country dearly. For example, TradeMe's Internet charges had increased tenfold in 2005 when Telecom and TelstraClear de-peered, forcing much local traffic to move via Australia. At the same time as Drury's paper, the ISPANZ called for an industry-based solution, and suggested government buyers of telecommunications services mandate their providers to become involved in peering. Drury said Radio New Zealand was providing streaming and hosting from both New Zealand and the United States. Even though 70 percent of the US traffic was bound back to New Zealand it was still cheaper than paying for domestic transit. The result: 'an unnecessary import component to a strong content export story.'[56]

In a comment piece in *Computerworld* in March David Diprose kept pushing the debate along. If it didn't make sense for courier packages destined for Wellington to travel via Auckland, Australia, or even the United States why would it be any different for Internet packets?

That's what had been happening to the traffic of many of the countries' ISPs since 2004 unless they paid TelstraClear and Telecom a premium to keep their traffic local. "Of course all this happens in the background so the customer may have no idea why their Internet

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experience is slower than it needs to be, and no idea they may be unnecessarily using international bandwidth, or that the Internet itself is less robust and lower capacity than it could be."[57]

InternetNZ organised a team of external experts headed by independent IT consultant and ex-Telecom CIO Dr Murray Milner to look at issues of peering and local interconnection to help devise industry approaches and solutions. Peering was firmly put back on the agenda by the David Cunliffe at the New Zealand Friends of O'Reilly (Foo) Camp meeting.[58] It was this meeting that was the catalyst for ISPANZ to take the issue further.

Telecom was now proposing a multi-points of interconnect project, which could at best be described as local peering, and consisted of the local handover of Internet traffic at network aggregation points across the country. ISPs would share the circuit cost with Telecom at the nearest local point of interconnect, and traffic would stay local. ISPANZ spokesperson Jamie Baddeley said the debate was far from over. "The proposal is not ideal, but it could be a lot worse … Telecom has come out and said they want a real consultative process on local interconnect … but they do need to listen to our concerns."[59]

The Telecom proposal to set up 29 regional peering points ultimately got the thumbs-up, after being fleshed-out by Telecom's wholesale division. Under the proposal, Telecom would peer or exchange traffic with all comers. Any ISP or content provider that saw a business case for peering with Telecom, and was willing to bear the cost and effort to do so, could interconnect with its network. The driver for local peering was mainly the improvement of performance for wholesale providers. Telecom wanted to avoid traffic tromboning over great distances.

Baddeley thought 29 points was a lot. "That means 120,000 possible customers approximately per point, which may not be the best number. Then again, having fewer points could see some smaller regional ISPs miss out on peering as they can't reach Telecom easily." He said Telecom's willingness to meet at existing shared peering points was good news for providers, even though Telecom may not 'peer' at the actual Internet exchanges (IX), such as those in Auckland and Wellington. Of greater concern, said ISPANZ, was that only Xtra DSL customers would be reachable through the peering points. Telecom's business customers were not covered and ISPANZ wanted that changed. "There must be reciprocity at all levels."[60]

However peering did mean Internet traffic could be shared between service providers over higher bandwidths in local areas – up to a gigabit per second – assuming the ISPs had networks 'up to the task,' said Baddeley. A more efficient local network and vibrant Internet community could lead to export success for local content and software developers. "If we've got a good fabric for communication we develop interesting applications. If they're interesting and worthwhile to New Zealand businesses then there is a good chance they could be of interest to the rest of the world," he said.

Paul Hayes, Telecom Wholesale's head of product management, said as well as better performance, local peering was part of a push to create a level playing field among New Zealand ISPs. Telecom would focus initially on peering Internet traffic from its retail
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brand Xtra with other ISPs. "Ultimately what we're doing is laying down the kind of infrastructure that allows service providers to develop their services." The 29 peering points tie in with Telecom's plans for its NGN which will provide high-speed Internet and a VoIP phone service to replace the current phone system.[61]

PIONEER JOINS NEW TEAM

CityLink had been a world pioneer in establishing open fibre networks, and independent community participation in civic affairs, as well as setting the pace for peering. When listed mobile radio company TeamTalk and a partnership of existing management acquired CityLink in November 2006 for $22.76 million, some thought the party might be over.

TeamTalk acquired a 76 percent shareholding in CityLink for $12.68 million and existing management acquired the remaining 38 percent balance of ownership. CityLink had been 98.7 percent owned by Lower Hutt businessman Ron Woodrow, who quit the company. TeamTalk had been looking around for several years for a suitable partner. Managing director David Ware said Citylink fulfilled that goal. "We were looking for a profitable company with a proven business model, a good management team, a New Zealand focus and a strategy for growth." He said the acquisition would capitalise on a 'mindshift' among IT and communications managers as they looked beyond the major telcos for cheaper and more advanced services.[62]

TeamTalk would contribute capital and administrative expertise to help CityLink expand, possibly even setting up metropolitan networks in smaller cities. CityLink already had some coverage in Auckland and had recently expanded into Christchurch. Both companies had wi-fi networks and there were broad opportunities with the government making available funding to expand metropolitan networks and looking at last mile opportunities for both the GSN and the Karen research and education network.

A new company, provisionally called Neuco, would be established to explore the opportunities, headed by CityLink managing director Neil de Wit, with equity of $2.5 million and around $5 million from TeamTalk.[63] CityLink's revenue had grown around 20 percent a year for the past four years. "The ownership change will not lead any formula changes as long I'm at the helm, nor should it. Operationally there is no change. I now have a new board focused at delivering even more good stuff," said de Wit.

"Telecom will bilaterally peer and use the current Internet exchange fabric where and when they choose. Additional Internet exchanges (IX) will slowly be rolled out by us as needed and local loop unbundling may drive that faster in the next two-three years." He said Telecom's motives were straightforward. "With LLU, their DSL network needs to have a sense of local otherwise Telecom will have to transport bits and bytes all over the country. Local peering is a must or they kill their own network capacity once 'real' bandwidth is in demand." Currently the Telecom DSL network hauls all domestic and local traffic to Auckland and re-routes from there. He believed TelstraClear would eventually follow suit.

NEW NETWORKS IN WINGS

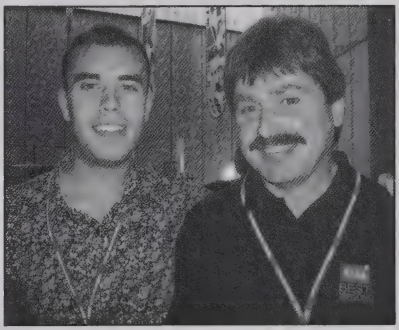
So who was going to benefit from unbundling? Certainly TelstraClear, Ihug, Slingshot and CallPlus, Orcon, Maxnet, Quicksilver, Iconz, and the dozens of smaller ISPs who were eager to deliver new speeds and services to their customers. Because of the high cost of creating national coverage there were widespread plans to co-operate by 'port sharing' or 'credit swapping' on each other's equipment.

At least three new nationwide high-speed DSL2+ networks were likely to emerge once the devilish details of LLU were worked through and embedded in legislation. One consortium of investors was planning an independent wholesale network once it could install its equipment at Telecom's exchanges. Other bandwidth wholesalers with independent city and regional networks; Broadcast Communications (BCL), TelstraClear, CityNet, Vector, Inspire, FXnet, and others, were also looking at alliances to expand beyond city boundaries.[26]

Orcon had committed to build a co-located network in the main centres which would wholesale to other service providers at a fair price and planned to install equipment in rural exchanges including New Plymouth, Whangarei, and Masterton. "This is such an awesome opportunity to build an independent network for the whole country that runs at 24Mbit/sec with ADSL2 or VDSL. Why would you spend all that money just to do a couple of exchanges in one area?" asked operations manager Scott Bartlett. He reminded ISPs the real cost was not hardware but in operating the network. "We are talking millions; we couldn't do any of our plans for less than $5 million and that's a fraction of the number it'll end up being. It would be naïve to think that even $20 million would build a nationwide network."

Ihug was still determined to invest at least $20 million over two years to reach 100,000 homes through piggy backing on the local loop, despite its Australian parent iiNet having suspended share trading due to temporary difficulties. With 'sensible LLU pricing' "There could be further investment," said Ihug chief executive Mark Rushworth. A fair deal would be $12–$16 per line, per customer, per month. The OECD average was $18 but for those who had unbundling for a number of years it was closer to $12–$16. Of course the more lines you took, the greater the room for negotiation. He suggested Telecom would keep DSL wholesale prices quite high to get a reasonable return on its DSL2+ equipment. However Rushworth warned if small ISPs decided to undercut the market just to get customers, Telecom and others were likely to drop their prices in response, making LLU payback longer and more difficult. "You have to be careful or you'll end up in a death spiral; you need a reasonable return for your investment in equipment. That's why everyone's watching what these prices will be."

He wasn't so concerned about speed, believing the environment to be similar to Perth, Australia where iiNet had co-located DSL2+ DSLAMs on the Telstra network and customers were getting 22–23Mbit/sec speeds, depending on distance from the exchange and the quality of copper. 'Heat maps' of customer density and penetration in Perth revealed 90 percent of those using its DSL2 service got greater than 8Mbit/sec, close to 50 percent were above 12Mbit/sec and 30 percent were getting 20Mbit/sec plus. That was sufficient to deliver most triple play services; video streaming using a MPEG4 codec, for example, only required 4Mbit/sec speeds. While Ihug would focus on voice and rapid access it would also be looking closely at video-on demand to keep the customers 'sticky.' It was interested



Scott Bartlett from Ocron and David Diprose from Ihug – winners at the TUANZ Awards.

Mark Rushworth, chief executive of Ihug.

in content and business offerings based on guaranteed QoS but Telecom could currently offer these.

Ihug saw mobile or 'quad play' as more attractive in the interim. "Mobile will become increasingly important for customer retention. You'll see Telecom come out with bundles where broadband is cheaper if you also have your mobile with them," said Rushworth. That approach had proven a more sound business proposition through BT Fusion in the UK and Free Internet in France. Eventually a multi-mode handset might be delivered as part of the broadband service, operating with IP on the home line as well as wi-fi and GSM. "Any IP calls are free and they can roam on their home wi-fi network or the public wi-fi network or hand off to Vodafone beyond that," said Rushworth.

TelstraClear would remain the biggest player in the new environment, and most likely the quickest to move. It would relish the opportunity to deliver its own DSL service enabling it to pick up on the aborted 2001 plan to deliver high speed services across the country. "We'd like to be treated the same way Telecom treats its other wholesale customers – we are their largest customer so they should be actively trying to sell to us. To date that hasn't happened," said TelstraClear spokesman Matthew Bolland. LLU was fundamental for TelstraClear which remained committed to the residential market and had built a new residential contact centre in Kapiti to service that sector. "We have spent $1.5 billion, have 1400 staff and have been fighting for ten years to get access so don't think we're going to sit by and not make the most of this opportunity."

Across the Tasman its parent Telstra has been forced to open up its coveted network to all comers since 2000, and so far around 150 rivals had jumped at the chance. They mostly had their own cabinets within Telstra's exchanges with racks of DSLAMs[27] or had deals with others to provide that access. Bolland said some of the potential nastiness between competitors was prevented by the fact that most of the contractors who installed and serviced the equipment were neutral. Standards were in place to ensure no one did anything to disrupt any other party's service. However Telstra remained a reluctant party to unbundling. It was still grumping away with the deregulation blues, watching its market share and share prices erode while it played catch-up with new network technology, dumping thousands of workers to become more competitive. It had already milked the 'sorry we lost the keys to the exchange' suite of delay tactics, and earlier in 2006 increased its rental on the copper lines to the likes of Optus, Primus and iiNet by $8 per line per month to $30.

Bolland admitted it had been a pretty ugly environment for investment in New Zealand, and along with many others, he was waiting for the rules of the new game to firm up before announcing any financial commitment. "When you've been fighting every inch of the way as we have, you are very aware the only reason these things are happening is because the government has intervened."

THE FIBRE DILEMMA

The new, tougher regulatory environment, outlined in the Telecommunications Amendment Bill, introduced into the House in June 2006, was expected to rapidly bring an end to repressive data caps that curbed Internet use, and hasten the arrival of pricing models and speeds more aligned with the marketing promises of the always-on digital lifestyle. One thing was certain: business and home customers, investors, ISPs, and equipment vendors who'd been held back from tasting smart

multimedia services now available in many parts of the world could at last see something resembling a rich 3D media pot at the end of this rainbow.

New networks that would bypass old technology and go direct to DSL2+ DSLAMS and modems capable of delivering up to 24Mbit/sec download speeds were at last on the agenda. Hopeful competitors were promising Internet surfing would power up to 10–24Mbit/sec, finally bringing the country in line with the streamlined services enjoyed elsewhere.

Telecom's roughly 580 exchanges had in recent years been reduced to around 440 and with the advent of its NGN overhaul, it was believed this number would be further reduced. What you would get instead were more roadside cabinets with fibre-optic cable back to the main exchanges shortening the distance copper had to travel to homes and businesses. The last mile or local loop typically used copper wires to carry phone and Internet services but there were now concerns Telecom, forced to concede access to its copper lines, would ramp up its fibre roll out, taking its cabinets closer to the curb and increasingly bypass its main exchanges. Unbundling fibre was not part of the proposed legislation and where it proliferated, LLU competitors could literally be cut out of the loop.

Nortel New Zealand managing director Rob Spray said many telcos around the world were taking fibre direct to small street cabinets on the curb and making the copper loops so short it made unbundling the loop physically difficult. A major regulatory argument was already brewing across the Tasman and in other parts of the world, with new network investors fearing their investment in DSL would be lost if fibre got any closer to their customers. "They're saying unbundling the local loop from the exchange is yesterday's argument. They're taking fibre to the curb, to the business and eventually to homes and you don't unbundle that unless you start unbundling wavelengths," said Spray. In Australia those investing in fibre wanted a safe harbour for the next ten years, and a promise competitors wouldn't be given access. They were threatening to cut back their investment unless the regulator acted in their favour.

However Ihug chief executive Mark Rushworth was sceptical about suggestions Telecom was trying to bypass the copper loop with its NGN. "What is happening in some built-up areas and new subdivisions is not necessarily an indication of what will happen out in the suburbs of most cities and towns. A lot of those next generation cabinets will still be situated in existing exchanges – it just doesn't make economic sense unless Telecom uses this tactic as a defensive blocking strategy." Rushworth's market intelligence was that even if the current 440 or so Telecom exchanges were reduced to 200 over the next year or so, Telecom's NGN would still give 70 percent coverage for local loop investors. However people shouldn't expect instant changes: the benefits were likely to filter down, with most activity initially in high-density areas where the business case; read 'the quickest profits,' made most sense.

Meanwhile Telecom attempted to reassure the market there was still plenty of life left in its copper network. A team of Telecom executives was evaluating a faster roll-out of interactive next generation broadband services based on ADSL2+ which it had been trialling since mid-2005 in conjunction with its technology partner Alcatel. The stated benefits were better traffic handling, further reach and faster speed, up to 15Mbit/s download and 1Mbit/s up. Distance from the cabinet was all important, but most homes would get the advertised performance. Telecom was also keeping an eye on very high-bitrate DSL (VDSL), which had the potential to offer speeds of up to 52Mbit/sec.[28]

PIPES OPENED UP

Telecom had been 'squeezing the sponge,' as one commentator so aptly put it, but the sponge and competitor and customer patience with its anti-competitive attitude had run dry. Under new

chairman Wayne Boyd the new-look Telecom had a major challenge to win back public trust and confidence. It needed to act rapidly to improve its service levels and help desk wait time. One report showed there were more customer complaints about faults in 2006 than any time in the previous three years and it was taking two weeks or more to sort them out. Many complaints resulted from winter dampness when old or decaying copper, particularly in suburban and outlying areas, once more proved the cable was well past its use-by date.

Expectation of true broadband connectivity had taken a giant leap forward with imminent unbundling legislation forcing Telecom to open up the throttle for bigger bandwidth to its customers and competitors. An ISP survey released by Statistics NZ in March 2006 showed dial-up subscribers were in decline and broadband subscribers had jumped by a third over the previous six months. There were 57 ISPs, 8 fewer than in the previous period. Internet subscribers totalled 1.3 million and just over a million were residential users with 70 percent still on dial-up connections. Within a year many regional and smaller providers, would be absorbed by those higher up the feeding chain, in a rush for customers, coverage, specialist skills, and innovative technology.

Wholesale broadband to ISPs other than Xtra had been choked back to 2Mbit/sec maximum speed, then edged out to 3.5Mbit/sec as legal and competitive pressure mounted after the TelstraClear determination. Then suddenly it was a free-for-all. Telecom, as required by the Commerce Commission, announced that from October 2006 all ISPs would get unconstrained broadband. By the end of the month most ISPs had announced new plans for faster Internet access, starting as low as \$20–\$30 a month, and at the higher end data caps and speed bumps almost disappeared. Xtra led the way, giving its broadband subscribers access to the maximum download speeds their copper telephone lines could cope with.

Those fortunate enough to live in a neighbourhood close to an exchange, with high grade copper lines and low broadband use, could potentially achieve speeds of up to 7.5Mbit/sec. In most areas, however, it was more likely to average 2–3Mbit/sec. Existing customers on 256kbit/sec and 2Mbit/sec monthly plans were automatically boosted to the new full speed. The best prices were available to customers who had a phone account with Telecom or Ihug, which had recently entered the home phone market; otherwise there was a \$10 premium.

All but gone were the monthly data caps that either resulted in a premium being charged for every megabyte over the limit, or Internet accounts being choked back to dial-up speeds. The only restrictions were based around a fair use policy; if someone was downloading hundreds of gigabytes of data and disrupting network use during peak hours, a level of traffic management applied.[29]

Telecom marketed its new broadband plans as 'blazing' and 'super fast' but the fact was this was like a scene from *Back to the Future*, only the names had been changed to prevent embarrassment. Back in 1999 Xtra's debut JetStream full speed account promised to deliver whatever speed the line was capable of. Depending on line conditions and distance from the exchange pioneering users could get up to 8Mbit/sec downstream and 256kbit/sec upstream for \$90, although there were severe data caps of 500Mb which meant using more than your monthly quota could be expensive.

However Telecom had stopped offering full speed accounts in 2003, supplanting them with a range of staggered accounts from entry-level 128kbit/sec and 256kbit/sec up to a maximum of 2Mbit/sec then more recently 3.5Mbit/sec. Those on grandfathered 'full speed accounts' were now paying \$60 a month with the data cap extended to 600Mb and given the option to shift across the 2Mbit/sec accounts with a 128kbit/sec upstream cap and a data cap of 1Gb all for the same price. Many users were furious; they were being asked to step down from the luxurious high speeds they had been sold as pioneering DSL users with very little alternative for those who wanted to expand their use than to take the lesser road.

Telecom general manager of consumer marketing, Kevin Bowler, said it removed unconstrained speeds because customers were not buying them in large enough numbers. It decided to bring them back because customers were increasingly using the Internet to download larger files, such as videos, music, gaming, and other interactive services. InternetNZ executive director Keith Davidson had another view, claiming Telecom removed unconstrained speeds for most customers because it was concerned about 'underinvestment in the network' and its ability to cope with large numbers of customers on high-speed plans. "This was a way of manipulating the network to get the traffic into manageable segments rather than investing in the network itself."[30]

Xtra's new monthly rates gave an indication of what was ahead for all ISPs. A basic plan at $30 a month attracted a 200Mb data cap but the speed restrictions had gone. The $30 Go plan retained a 1Gb data cap, slowing to dial-up once the limit was reached. The Go Large offering at $50 did away with the data cap and cranked up the speed to line capabilities. Plans for those who wanted to send a lot of data, boosted the 128kbit/sec upstream speed limit to 256kbit/sec–512kbit/sec but brought back data caps (2Gb – 30Gb), ranging from $50 to $150.

ISP EVOLUTION ESCALATES

The pressure was on. Those who jumped in the deep end, following Xtra into the full speed Internet pool offering the highest speed line conditions allowed, had done so at a cost. Many ISPs claimed they were paying out several dollars a month for each customer but had little option if they wanted loyalty from a jittery client base closely monitoring market shifts.

Their hopes hung on imminent legislation, which they believed would provide a much better wholesaling deal. Otherwise they were up the creek without a paddle. The only way to make money was to offer voice, video content, mobile, and business grade services which would become hotly contested once the network opened up. Only those with deep pockets, strong branding, and enough value to add to their services would still be standing when the dust settled. Partnerships with outsourcing companies and equipment providers were essential. Certainly the winds of change had seen Ericsson, Alcatel, Nortel, Siemens and Cisco field increased inquiries for major carrier class and CPE.[31]

"Everything in the industry is for sale. It's all up for grabs," said Woosh chief financial officer, Gary Neil in a *Computerworld* article in July 2006. Telecom, TelstraClear, Vodafone, Ihug, Orcon, Slingshot, CallPlus, Maxnet, and Iconz and even the vendor and systems giants behind-the-scenes;Juniper, Cisco, Alcatel, Lucent, and Ericsson,[32] were all up in the air.

INDUSTRY EXPOSED

If ever there was a case for ISPs to become the fully fledged telcos they'd always wanted to be, this was the time. Changes to legislation, Telecom faced with a regulatory split, rumours about Ihug's future ownership, ISPs being acquired, new DSL speeds and competitive pressure were delivering a challenge that could not be ignored.

Woosh had gone out on a limb when it moved to a wireless business model. Now it paid the price for the risk and was looking to bolster its viability by acquiring an ISP and Vodafone was dipping its toes into the world of 'fixed-mobile convergence.'

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The shake-out had actually begun earlier in 2006. Alliances were being formed, partnerships forged, acquisitions considered, and conspiracies hatched as major and minor players visualised the opportunities ahead in a new era of competitiveness. Smart ISPs were already putting NGNs and converged billing systems through their paces and eyeing ways to add value to their broadband offerings, including voice, business-level services, data warehousing, security, e-commerce solutions, and even IPTV and video-on-demand.

It was a time of tidying up loose ends. It was the end of an era for pioneering ISP Ihug, which announced in February 2005 that it had sold its broadband satellite service to Australian rural ISP Bordernet. The service began life as StarNet in October 1997 based on a microwave link from Auckland's Sky Tower. It offered download speeds of up to 1Mbit/sec, well ahead of Telecom's JetStream. The upload service ran over existing telephone lines but the company admitted it was never really a winning formula. The subsequent Ultra satellite service provided to subscribers beyond the central city and in rural and other regions, however, remained the only broadband option for many years.[33]

Vodafone and Telecom were both pushing 3G mobile phone services, which delivered higher speeds for data and even videoconferencing. While mobile was a major global trend the local cost was still outrageously high for Internet surfing. Wireless access, however, remained an attractive local loop alternative. In October 2005 South Auckland utility company Counties Power sold Wired Country, its wired and wireless provider, to Auckland ISP Compass Communications. Compass chief executive Karem Hussona said he would extend Wired Country coverage and the range of services offered. Counties Power also sold a of its 3.5GHz band radio spectrum management rights to Telecom.[34] This was the first indication Telecom was seriously looking at moving into wireless broadband. It had acquired spectrum before but never used it and its only foray into the field so far had been through its partnership with BCL.

Then Auckland wireless voice and data provider Woosh made its move, acquiring Auckland ISP Quicksilver, which claimed around 10,000 customers. Quicksilver knew it needed a cash injection, a bigger partner or both, if it was to continue to be successful in the emerging environment. Woosh had been in the game since 2001 with a fixed wire replacement solution. Now it had mobility options and was offering voice. It had been struggling to make headway; after three years and $130 million invested it had only 15,000 customers and had even begun selling dial-up accounts to supplement its wireless service. It was also moving to a WiMax-based platform but some of the spectrum it hoped to use had been clawed back by the government.[35] Its speeds had increased from 1.6Mbit/sec to 3Mbit/sec and another technology upgrade promised 14Mbit/sec speeds by the end of 2007. With Quicksilver on board it could now play in all the patches. The company had an aggressive expansion plan and was keen to place copper access equipment at Telecom exchanges.

DEFER, DENY, DELAY

CallPlus was sufficiently capitalised for the near future, planning to invest up to $200 million over five years on building out its WiMax network. Ideally

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though, its roll-out of nationwide phone and Internet services with IPTV as a likely third component would involve a mix with DSL. "It is quite appealing to go with WiMax and get out of Telecom's face with genuine alternative speed and reliability in the local loop, totally bypassing all the negotiating and complaining and permissions," said CallPlus director Malcolm Dick. Like everyone else though, he was waiting to see what kind of pricing was involved. "I would hope Telecom would come to us and discuss ways of doing a deal on the copper. Why wouldn't they try and entice us to use the copper loop? At least they get some business from us this way but with WiMax they get zero."

He suggested Telecom should have a management change, mainly because it was not well trained or experienced in doing 'win win' deals. "They've spent 15 years playing an amusement park game where they run around waiting for the little rat to pop up and then try and hit it with the hammer. It must be really hard having to turn around and start feeding them instead." Dick remained cautious, recalling his experience trying to interconnect a competing telco in Australia where Telstra publicly described his operation as 'a germ invading the nooks and crannies of their tariff.' He said incumbents typically used the three Ds: defer, deny, delay.

Ihug CEO Mark Rushworth was prepared to spend $200 million rolling out an alternative network that he could wholesale to other smaller ISPs. Like Orcon, he was keen on port sharing to quickly get the widest coverage. Rushworth, however, believed only two or three players could afford to create their own networks. He said the credit swapping model became the de facto way of doing things in Australia when Telstra refused to allow more than one provider into its exchanges at a time. "Optus would go into one exchange and someone else would put five cabinets in another and sell on that capacity. It certainly forced the industry to work together." He was hopeful CallPlus, TelstraClear, and Ihug could operate similarly. "It makes a the roll-out a lot quicker – we're certainly keen to work that way so we don't end up jumping on each other's toes."[36]

Ihug was leaving Australia to its new Perth-based owners iiNet, "overhauling its product line, re-energising the brand and reducing operating costs." As New Zealand's largest wholesaler of DSL broadband, it had announced its intention to deploy its own network once access to Telecom's exchanges was permitted. In fact the country's third largest ISP, with around 120,000 customers, was ripe for the picking with iiNet suffering some setbacks in profitability. It was placed only behind top dogs Xtra with 500,000 customers and TelstraClear with around 200,000.[37]

Orcon was even cheeky enough to send out a press release saying it would love to buy the company. An hour later another press release qualified that it 'wasn't actually in discussions at this time.' Then on 9 October 2006 Vodafone stepped up and offered its hand. Vodafone ad battled from way behind in the mobile phone business to run a nose to nose race with Telecom, at times edging way ahead. Now it needed to add value in the converging marketplace and saw itself as the ideal suitor. Vodafone paid iiNet NZ$41 million for the ISP with CEO Russell Stanners saying the deal further strengthened its position in the market. "It's a perfect fit. Right

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now, we are the leaders in mobile, however we only have 20 percent share of the telecommunications market. When combined with Ihug's strength in fixed line broadband and calling, we can develop and deliver even more compelling propositions for our customers." Vodafone would remain a mobile-centric business and Ihug would continue to operate as a standalone company.

In February 2006 Orcon had taken on board Juniper's platform to meet increasing demand for scaleable high speed DSL software-based services giving it application-specific and per-customer QoS capabilities, including the ability to deliver multimedia broadband services. Then in August it announced it had also teamed up with hardware provider Siemens in a $30-million five-year plan to go straight to high speed VDSL2 for IPTV and related services. It planned to deliver voice services and IPTV with more than 50 channels, which it claimed it would be able to launch in late 2007.

Meanwhile Maxnet, Compass, Iconz and other second-tier ISPs were biting at the bit to show what could be done with better access to bandwidth. Each had their own specialty to differentiate from mere bandwidth resellers, whether it was e-commerce hosting, secure back-up, disaster recovery, software development, integration, or other ICT skills for the modern business. Alternative bandwidth wholesalers were also lifting their game to be ready for the new environment.

The Consumers' Institute's 2006 Internet survey which collated the views of 10,000 Internet users showed increasing dissatisfaction with Internet services. Only 66 percent said they were happy with their ISP, down from 82 percent in 2005. Xtra had come in for the strongest criticism – only 55 percent of its customers were satisfied, down from 78 percent in 2005. In particular its Go Large plan, which offered unconstrained download speeds and removed the monthly data cap for a flat-rate fee of $50 a month for Telecom phone customers, had been criticised for patchy download speeds.

The result was a high defection rate away from Telecom to smaller ISPs with a stronger focus on customer service and more flexible plans. The competition was fierce, with Inspire, Actrix and Xnet rated the best in the most recent Consumers' Institute survey and Ihug, TelstraClear, Orcon and Slingshot in particular trying to win Xtra customers by waiving sign-up fees and offering free modems and discounts.[38]

HOW COME FAST IS SLOWER?

Wholesaling had only made up 10 percent or less of Telecom's business but with Telecom Wholesale having Telecom Retail as its biggest customer, and the rush of activity predicted through UBS, LLU, and their variants, that was about the change. Telecom Wholesale general manager Matt Crockett insisted Telecom Retail would be treated the same as everyone else in the market for NGN products and services. Strong measures were in place to ensure equivalence, with monthly tracking and reporting around commercial terms, provisioning and lead times. "In the past the bulk of wholesaling was on fixed line and we had the bulk of that to ourselves but now TelstraClear and others have their own networks. WiMax is coming, Vodafone is getting into the wholesale space, and we have to make sure we have better products and service. We can't take anything for granted."

Telecom Wholesale already offered the full range of voice, data, interconnection, and networking services for residential or business end users and more than 100 service providers. Major wholesale products included UBS, a layer 2 connectivity service enabling customers to deliver broadband to their end users, and the newly launched QoS-based business grade Unbundled Network Service (UNS) to compete with Telecom's xDSL One Office. There was also the resale of Telecom retail products, at around 16 percent discount. Telecom Wholesale would handle interconnection between different service provider networks and international services through Telecom New Zealand International.

Crockett said his job was to provide a healthy portfolio of choice for differing appetites. A number of providers wanted to run totally independent end-to-end networks but for others there would be equivalent services that didn't require that kind of network investment. Telecom was in consultation over next generation Naked DSL to achieve higher QoS. There would also be 'white label' DSL or ISP-in-a-box solutions that could be re-branded by businesses outside the traditional telco arena, including The Warehouse or Dick Smith. Crockett knew he had a lot of work to do to grow the business aggressively. "I can only do that by helping my customers to succeed but we can't keep doing that dropping our pants on pricing."[39]

Then, just as everyone thought unconstrained access would finally give everyone more for less, there came a backlash. Telecom's wholesale customers Ihug and CallPlus claimed they had to spend millions fixing problems on their networks since the broadband gates were opened. Thousands of customers lost connections, sometimes for hours at a time. Both ISPs said the problems were occurring with Telecom's wholesale or UBS offering and had become progressively worse since June.

After the move to 3.5Mbit/sec plans, Telecom commissioned Alcatel to audit the state of the network. It estimated that 23 percent of customers were not achieving maximum peak download speeds, because of a range of variables including interference, the condition of the copper and distance from the exchange. After the upgrade to full unconstrained access Alcatel reported at least 5 percent of customers were actually receiving a reduction in Internet performance on what they'd had previously. Complaints about slower connections were rife, and many in the industry said the slowing of Internet speeds was far greater than that being admitted.

CallPlus and Ihug had not expected Telecom's kneejerk reaction when they took their case to the Commerce Commission demanding equal access to unconstrained bandwidth. Telecom had opened up the throttle for all its Xtra customers, effectively forcing other ISPs to offer a similar service. "They went beyond what they were required to do, voluntarily moving all their retail customers to full speed, but not their wholesale customers who were kept on the old plan." That meant Ihug and other ISPs were in a loss-making situation when it came to delivering the new all-your-line-can-handle Internet accounts. "We don't make money out of broadband at all unless we bundle it with other things. We have to buy that at above retail cost and we lose money on every single customer we sell to," said Ihug general manager of regulatory affairs, David Diprose.

Malcolm Dick, co-founder of CallPlus and former managing director of Netway Communications.

Most of the complaints about slower speeds, said Diprose, were not because of the speed of access but congestion, which was seriously slowing down the Telecom network. With everybody now trying to use full-speed it was like the traffic jam at peak hours in Auckland. "It just doesn't provide enough backhaul capacity to cope with the growth in use." Telecom insisted it was adding capacity to

Matt Crockett, head of Telecom's wholesale division.

its network to cope with growth. "We have made some backhaul adjustments and are in the process of revealing those. Everyone gets the average and for most people the average is better and for some its worse. That's a feature of the Internet," said Matt Crockett.[40]

Ihug chief executive Mark Rushworth said his company had spent $500,000 enabling its network to support the large numbers of customers who lost connections. It had increased call centre staff by 20 percent and compensated some customers with credit notes. Ihug was fortunate that it had the financial support of its parent group Vodafone to invest in the network problems, but the long-term damage to its brand and reputation could not be calculated. It even asked Telecom for compensation but wasn't holding its breath. CallPlus chief executive Martin Wylie said the company spent 'millions of dollars' to manage the customers in the call centre and on fixing network problems. "The industry is trying to absorb it, which is putting more pressure on companies that are already finding the going very tough. We are making a loss on every broadband customer and the technology that Telecom provides is not performing, which forces us to put in more investment and put more staff on."

Telecom's Matt Crockett said the company first alerted customers in mid-September and within five weeks had fixed 95 percent of the problems. "We struggled to get to the root cause, but we did isolate it and fix it." Telecom accepted that it needed to do more work on its wholesale service and would continue to work with wholesale customers to avoid problems in the future. "There are going to be issues around a fast-moving market and complex technology like broadband. None of us are happy with the experience for our end users in the past few months."[41]

A week later Telecom chief operating officer Mark Ratcliffe insisted 'relatively few' of the problems tracked back to an issue with the Telecom network, insisting Ihug and Slingshot were 'not geared up' for the large migration of customers onto new broadband plans. "As well as a massive migration to broadband, we are fronting on a global basis another spam war. About 95 percent of the email traffic we carry through the Xtra network is spam."[42]

THE DEVILISH DETAILS

Once the direction was set by the government in May 2006, Telecom and the Telecommunications Carriers' Forum including InternetNZ formed a working group with the ISP industry to look at methods of achieving unbundled local loop and naked DSL ahead of legislation. They worked on the technical and operational standards for LLU as a basis for either regulated or commercial agreements. Many of the InternetNZ proposals were taken up, including a review of spectrum allocation to improve community wireless access, and the need for operational separation of Telecom. A suggestion was also made to develop a fibre-to-the-home roadmap, said InternetNZ.[43]

Maurice Williamson, the opposition's IT and communications spokesman and a member of the select committee that reviewed the submissions on the Telecommunications Amendment Bill, insisted some historical context be considered. He and others in the National Party along with Business New Zealand, the Business Roundtable, the Shareholders' Association, and Federated Farmers opposed the government's unbundling announcement as a confiscation of Telecom's property rights. His role as an evangelist for all things technical hadn't lessened since he was the country's first IT minister and his ability to spin a great yarn seemed to have improved with age:

"Clear Communications' main owner British Telecom came down a couple of times and badmouthed them for not doing this and that, saying how outrageous the environment here was. So I took the buggers on one day. I had a big clipboard and I went through all of the things that I thought were just appalling. I said, 'The dominant carriers refuse to allow interconnection at proper rates, they're using technology as a non-tariff barrier to stop you getting entry; you can't use signalling at carrier level to move caller line ID across the switches,' and on it went. Then the guys at British Telecom said, 'Oh minister, it's such a treat to do business with you, a politician who is so well briefed.' And I said, 'Well I don't think you're going to say that after I finish because this is all the material that I've got from England about your company's behaviour in the UK.' They were just shattered. So I said: 'Don't come down here to the antipodes trying to tell us all the crap about opening up a deregulated market when back home you're the worst bloody example of monopoly abuse.'"

Williamson said he was reminded of that double standard when discussions on LLU came up at the select committee hearings. "TelstraClear started making a big submission on the need to break up the monopoly to give them unbundled access. I got first question and asked Alan Freeth, the chief executive, 'Mr Freeth, have you read the Telstra submission?' And then everyone went absolutely silent, like, 'Williamson's made a mistake here.' He said 'Mr Williamson, we *are* Telstra.' I said, 'No, Mr Freeth, I see on your submission here that you are TelstraClear. I ask you again, have you read the Telstra submission?' He said, 'Oh, they haven't made a submission on this bill.' I agreed, 'No, they haven't, you're dead right, but they made one on a very similar piece of legislation in Australia. Have you read that?' He hadn't, so I read some of it to him. 'The government's unbundling local loops was an outrage, the government's interfering in property rights was a disgrace…' And I just kept reading these quotes. I said, 'You agree with these. Tell me when I go through them whether you agree with them or not.' And he was just glaring at me."

The next submission in the series was from Telecom and Williamson insisted on equal treatment when evaluating the presentation put forward by new chairman Wayne Boyd and CEO Theresa Gattung. "When Theresa finished, I got the first question again and said, 'Theresa, could I ask you … have you read the AAPT submission?' She didn't hear me take Telstra to pieces because they were out of the room. 'AAPT? Mr. Williamson, those are not…' I said, they made a submission in Australia and I've got a mate in the Australian Parliament who sent me copies of all their papers. Can I read you what they say? 'The dominant carrier is holding on to an abusive monopoly position so the government must break it up, must make it available, must give access to all new players so they can get realistic access at the right price' and on it went. There was just silence in the room so I said, 'You obviously agree with all this?' She said, 'No, that's AAPT.' 'Well hang on, don't you own AAPT? Isn't it your company? Well I'm sorry but I really had a gutful for over a decade now of telcos when they're here saying how dreadful it is and demanding it all, and when they're overseas saying how dreadful when the same thing happens to them there.'"

Theresa Gattung succeeded Roderick Deane as Telecom CEO from October 1999 until her resignation which became effective from June 2007.

Williamson said he has nowhere near the regrets some people imagine he might have about not getting heavier with Telecom in the early days of deregulation. "It wasn't that I didn't want to. I thought Telecom were bastards and I told them so, and I tried to keep a sword dangling as tightly over their throats as I could. But in the end

there were certain things and some of them involved property rights. I'm on the board of a private company here in New Zealand and every time we're investing overseas, my very first question before we go into any of the detail of an investment is, 'How is this country for respecting private property rights?' And I think the local loop unbundling stuff that's happened, and the breaking up of the private companies by force will have a significant impact on foreign investment coming here, whether it's to invest in the electricity network, or even in the broadband investment side of things. I have no problem about compensating private players; we have to do it all the time when we take land off farmers for roads. We try to negotiate before a compulsory acquisition but we well and truly compensate for the land loss."

Williamson was concerned Internet development may be one of the main things that suffered through lack of investment. "There's a huge amount of investment needed in our total network. Our exchanges are still bloody crap, the copper to a lot of rural and remote New Zealand is such rotten copper with so many breaks and nodes that it needs a major upgrade. The cyber backbone and backhaul stuff needs dramatic upgrades and the nodes in the suburbs are going to require a huge level of investment. I hope I'm proven wrong, but really I worry whether Telecom is prepared to do it, if it has to give away what it's invested in to anybody else that's playing in the game.

"There's obviously a lot of cherry-picking and a lot of low-hanging fruit in the CBD where you could easily make money from rolling out fibre and Internet infrastructure but it needs to go out to everyone. In fact it's more important to get to rural and remote New Zealand so they don't have to drive 100km to town to register their vehicles and then home again. You have to think, what is that taking off their GDP for the day in terms of productivity and the fuel burned which adds to Kyoto breaches and the like when it could all have been done over the Internet?"

INFRASTRUCTURE INCAPABLE

Submissions to the Telecommunications Bill were still being worked through in September when someone with intimate and long-term knowledge about the Telecom network dropped a bombshell. Former Telecom chief technical officer Murray Milner, representing the IPENZ, believed Telecom's copper cable was a major obstacle to the country moving into the top quarter of broadband OECD figures. In presenting IPENZ submission on unbundling, Milner said $1.5 billion needed to be spent replacing copper cables with fibre-optic cables if New Zealand was to match the infrastructure now available in countries such as Iceland, Japan, and Denmark. That kind of spending could reduce the length of the average phone line from 2km to 800 metres and result in 90 percent of New Zealanders having access to 5Mbit/sec speeds, the goal set by the Digital Strategy.

While the institute, which had 10,000 members, supported the regulatory update and believed unbundling was 'long overdue,' prices for access to Telecom's network would have to be set at a 'fair level' to ensure there was sufficient incentive for Telecom to make the necessary investment in fibre. The only alternative might be for the government to dig into its own pockets. Milner dismissed the possibility that mobile broadband products such as Vodafone's 3G broadband service and Telecom's T3G network could provide mass-market alternatives to fixed-line broadband in the near term. He said that would require 100,000 cellphone towers to provide 5Mbit/sec connections to 90 percent of New Zealanders and cost about $10 billion, roughly the same as fibre to the home of all New Zealanders.

The availability of contract labour meant telcos could probably invest only $100–$200 million a year on replacing cables. In order to justify the $1.5 billion investment, half of New Zealand households would have to spend $100–$150 a month on triple-play services, such as broadband, phone calls, and Internet TV. That was likely only if the dominance of Sky's satellite-based pay-TV

service was broken and sports events and movies were delivered to consumers in interactive form over broadband, said Milner.[44]

Meanwhile InternetNZ executive director Keith Davidson was disappointed Telecom was continuing to claim its operational separation proposals were better than those implemented by British Telecom. The Internet lobby group had previously detailed the stark differences to the select committee and was frustrated Telecom chairman Wayne Boyd hadn't made himself better informed on the issues. "Telecom's operational separation plan is clearly inadequate because it does not include separation of the core network, where the 'enduring bottleneck' exists," said Davidson. British Telecom's model created a separate division for the network assets, providing equal access to all ISPs including BT wholesale services group and retail operations.

Telecom's plan only provided 'Equivalence of Inputs' for three services. "Many ISPs have raised the issue of Xtra having favourable terms, and the recent Telecom retail pricing announcements have only highlighted the issues of Telecom treating its own ISP differently," said Davidson. "Legislation for an operational separation plan is essential." InternetNZ had attempted to provide a convenient mechanism for including this provision in its submissions.[45]

ISPANZ also issued a last-minute warning for its members and the public not to be fooled by Telecom's claims. It rejected the attempt by Telecom to push its 'inferior operational separation plan,' and seriously questioned its commitment to industry co-operation and the spirit of the government's policy direction. It railed against Xtra's latest retail plans that created a price squeeze on ISPs and then discovered that despite requests to adjust 'the inadequacies of its operational separation plan' no amendments had been made.

ISPANZ director Graham Walmsley said the organisation of 30 ISPs wanted operational separation but not in the form Telecom was proposing. "Telecom seem to think that if they make the claim often enough people will believe them. Telecom clearly does not 'get it' and this is of major concern. We are seeking a level playing field where we can compete in a competitive market with equal access to the monopoly infrastructure. That infrastructure must be separated into another division – accountable and incentivised separately, as British Telecom has done." ISPANZ said in the Telecommunications Amendment Bill the government must have the power to mandate separation without further legislation and that the threat of further structural separation must remain.[46]

The draft bill only provided for a modest accounting separation regime for Telecom. InternetNZ had made stronger written and oral submissions, similar to the statutory framework in Australia. This was picked up in the final draft. Its proposals were centred on the public good of the Internet, its users, and the economy. "The real challenge will be implementation . . . The government will need to get the separation plan right and the Commerce Commission needs to be given the money and people to make sure the plan can be enforced," said InternetNZ in its December 2006 newsletter.[47]

The Telecommunications Amendment Act (No 2) was passed into law on 18 December 2006 with urgency. The revised legislation upgraded the Telecommunications Act 2001. When the bill went into select committee it proposed separate accounts for Telecom's business arms, but after six months of consideration it came through with a much tougher regime. Telecom would be forced to undergo a three-way operational split, with retail, wholesale, and network arms. The split would take place after public consultation, and both David Cunliffe and the Commerce Commission would be given powers to ensure that it happened in a timely fashion with wide-ranging powers to monitor and enforce access to the local loop and regulate other aspects of the telecommunications network. Cunliffe said history had been made and the ammended lawl would bring faster and better broadband service.

The speedy passage was in stark contrast to the glacial movement of previous attempts at telecommunication regulation where successive governments had been persuaded to remain with a relatively light-handed approach. Labour's former Communications Minister Paul Swain had fought to unbundle the local loop, but was overruled by Cabinet. Under National, Telecom persuaded then Telecommunications Minister Maurice Williamson that regulation was unnecessary, but Williamson later made it clear Telecom had not delivered on its promises to him. The new regulatory regime looked for the first time like a 'hands on the shoulder' style, as opposed to the wet postage stamp approach of the past. There was the potential for up to $10 million in fines if Telecom was slack in following through on operational separation into wholesale, network access and retail business units.

The comprehensive regulatory package, modelled on similar laws around the world included unbundling, at the local loop, at Telecom's exchanges and its distribution cabinets. It also provided access to so-called 'naked DSL' for Telecom's wholesale providers, removing restrictions placed on real-time services and upstream speeds for UBS which the Commerce Commission introduced in 2003. The Telecommunications Commissioner would also be given new powers under the Act.[48]

David Cunliffe expected operational separation of Telecom would be completed by the middle of 2007. His office, alongside the MED, would manage Telecom's split and finalise the requirements of an initial plan for separation by February. He would then invite public submissions, which could be further amended. He had the power to approve or decline the plan. "I think it would be an optimist who thought it would be perfect first time, but there is so much detail to be gone through," said Cunliffe. He was looking forward with 'renewed vigour' to the development of the IT sector, a rural strategy, rolling out further digital strategy funds and new broadband wireless services.[49]

GRINCH STEALS CHRISTMAS

While all the focus seemed to be on Telecom and its exploits, the changes in regulation and the grand plan for a new no-holds-barred environment, it soon became apparent that all wasn't well across the road at TelstraClear. It should have been a time of celebration, of Christmas parties and thinking happy thoughts about sun, surf, and sand. However TelstraClear CEO Dr Alan Freeth was in no mind to be playing jolly old Saint Nick. What he pulled out of his sack shocked not only his staff but, when it was leaked, left the industry scratching its collective head.

In a 2000-word, metaphor-packed message he explained the company was 'on a trajectory to disaster.' It was being 'out marketed, out smarted and outgunned in the marketplace,' it 'lacked the killer instinct.' 'We are too tame, too lame, and too timid to call ourselves a challenger,' he ranted. Instead of Winding the competition and making it bleed like Uma Thurman did in Quentin Tarantino's *Kill Bill*, TelstraClear was acting more like Captain Feathersword in the children's show *The Wiggles* or Disney's *Bambi*. Freeth insisted TelstraClear needed to become 'pre-meditated, cold-blooded killers of our competition.' Instead of a summer of sunshine and barbeques, up ahead was 'a winter of despair' based on current forecasts. An expected $14.8 million profit could become a $7 million loss unless staff worked harder in 2007.

Freeth said Telstra's chairman had accused him of running a company that was 'out of control.' Customer service was indifferent at best and 'rubbish' at worst, resulting in a gradual loss of customers. Plan numbers were not being achieved, there were billing problems and product development needed to be sorted. The SME unit had a backlog of 300 orders which needed quicker installations. Cost containment was high on the list with the suggestion the headcount was too high and staff were travelling too much, some acting like 'petulant teenagers' and some focused on their pet projects regardless of what was happening around them. Some of these would be shut down. Questioned

about his message, by journalist Juha Saarinen, Freeth said it was 'a clarion call to arms' given to about 50 senior managers and posted on TelstraClear's intranet; even the projected loss might not have been accurate, it was intended to motivate staff. He claimed staff reaction to his Christmas tidings was 'incredibly positive,' and thanks to impending regulation, 2007 was full of opportunities for TelstraClear to move into full challenge position.

22

In the recovery room

Remedial reading required

Local authorities, health and education need access to bandwidth like they need access to a building. You need different pricing models and the telco world has been slow to recognise that.
Laurence Zwimpfer, 20/20 Communications Trust, 2007

Technology in health and education has evolved haphazardly under ill-informed policies that allowed public good sectors to evolve their own networks and disparate IT systems in a competitive funding environment without properly considering how everything might ultimately tie together.

Billions of dollars have been invested in proprietary approaches to support our physical and intellectual well-being, but the logic of achieving efficiency and cost savings by sharing common data across a single high-speed network has only recently started to register at ministerial and boardroom level.

Huge savings were possible through shared services across the health system, for example, eliminating paperwork and duplication of effort. People in outlying areas could be remotely diagnosed by specialists from major hospitals, surgeons could consult by teleconferencing, X-rays could be sent instantly and waiting lists reduced dramatically. The same principles, if applied to education, would have experts locally and across the world collaborating and sharing their wisdom and insights with classrooms of young people using interactive video-conferences as part of an on-line curriculum where lessons were updated based on the student's pace of learning.

There are only a couple of vital areas where government involvement is imperative in a society that values its people and plans for the future. Good government should provide and maintain essential infrastructure, foster justice, equality and open participation in decision making, protect our borders and provide the best possible health and education systems taxes can afford.

In August 2007 it was clear that something was very wrong with our health system. Emergency rooms across the country were full to overflowing, with people on trolleys lining corridors waiting to be admitted to already overcrowded wards. Even ambulances were backed up waiting to discharge patients at some hospitals and unable to answer further call-outs while they were in the processing queue. There were horror stories about the severe pain people were in, and the humiliation they suffered waiting long hours for treatment.

The government solution to the growing surgery waiting lists of people already pre-selected for further care by their GPs had been to regularly cull the lists so the numbers didn't look as bad. Hospitals were crying out for more nurses and doctors, who were in turn crying out that they were overworked and underpaid. Meanwhile the hospital boards who administered the funding were being forced to reduce their budgets and operate with a profit motive rather than as public good agencies there to heal, restore, and reassure.

EMERGENCY SQUEEZE

Many emergency departments in New Zealand were already operating in disaster mode and while it was still thought they could cope in a real disaster, it would be 'majorly challenging,' said Wellington Hospital emergency department clinical leader Peter Freeman. He was speaking as one of two New Zealand representatives on the Australasian College for Emergency Medicine which had published a survey of Australian hospitals. It found caring for patients who could not be sent to overcrowded wards soaked up about 40 percent of emergency department workloads.

He told the *Dominion Post* that Wellington Hospital staff regularly had to open concertina wall dividers – designed to expand the department for mass casualties in natural disasters – to accommodate more patients. On 5 August 2007, Wellington Hospital's emergency department had 41 patients for its 21 cubicles; seven patients were waiting for ward beds, one had been there for ten hours, and 15 were waiting to be seen. Auckland's North Shore Hospital was so overcrowded that ambulances were stuck in a holding pattern waiting for patients to be admitted.

Dr Freeman said hospitals nationwide were 'squeezed' so much that some patients spent days in the emergency department, never making it to the wards. District health boards needed to make patient flow and bed management a core focus. Health Ministry Principal Medical Adviser David Galler, a Middlemore Hospital intensive care specialist, said emergency department overcrowding was well recognised. This could be eased by better systems to improve patient flow to wards and predicting high demand. The quality improvement committee, which provides advice to Health Minister Pete Hodgson, would make a recommendation on patient flow, he said.[1]

Sherryle Roberts' eyes glisten with tears. "It was hell," she says. "Mum was lying there on a trolley, under this glaring fluorescent light … The place was busy, noisy, with constant movement. Police came in with people handcuffed to them – big rough guys walking past. And there's Mum, who's 83 and basically law abiding, who's paid her taxes, and never put a foot wrong in her life ... "It was such a scary, horrible experience."

This is the rough edge of North Shore Hospital's emergency care system. Ms Roberts' mother spent four days in the emergency department, with a broken hip. Because she was waiting for surgery she was not allowed painkillers, or anything to drink or eat. And because she suffers from dementia she was doubly upset. She did, however, realise that she had been put in nappies – and instructed to use them. "She was saying, 'it's my dignity.' When they came to clean her up they wheeled her into a cubicle, and I'm holding her, saying 'It's all right Mum' and she said, 'No, it's not all right. Don't let them do this.'

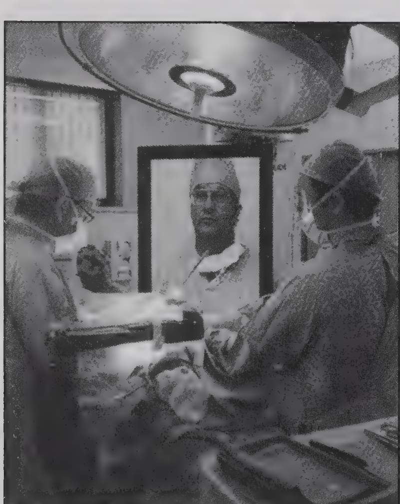
Her mother's operation was scheduled for the Sunday, then cancelled, so she was allowed pain relief and food. The third day she was on the list – starved again – then "bumped" about 3.30pm. Then, on the fourth day, in the late morning, she was wheeled into theatre. For most of the preceding four days she had not been allowed to eat or drink. A doctor who does not want to be identified said that the care of Ms Roberts' mother was unacceptable: "The chest and the heart don't do well if you leave people lying around with broken hips."

"I left for a rest while Mum was having the operation and when I came back she was recovering in ward four," says Sherryle. "Then I got called to the nurses' station. They were releasing her. The ambulance ... came and picked her up and she was back at the rest home in Waitakere by six." Her mother had had a proper hospital bed for around two hours. There was virtually no postoperative care. And she has never walked again.

The hospital was short of 60 full-time nurses while its tower block wards were running at near 100 percent full. Because of the way funding is calculated, Waitemata DHB, which has the healthiest and wealthiest constituents in the country, is the lowest-funded district health board in New Zealand.[2] Staff shortages, dissatisfaction with cumbersome systems, inefficient management, low wages, and stressful working conditions have taken their toll on the skills base within the health system for years.

National Health spokesman Tony Ryall said in August 2007 that after more than 40 health workforce reports over eight years there had still been no solution to stemming the downgrading of the workforce of enrolled nurses.

Despite a mounting crisis in the health workforce, the number of enrolled nurse trainees has dwindled, one of the two training courses has closed, their name has been changed to 'nurse assistant,' and the profession has been increasingly marginalised as they have been pushed out of public hospitals. Not surprisingly, the dedicated people in this profession have become demoralised and disenchanted by their appalling treatment ... Who will be left to step up and support registered nurses if there isn't a solid enrolled nursing profession in the wings?[3]



Telemedicine. High-speed communications, across the health sector could enable experts to be consulted remotely to assist with difficult operations or teams of specialists to collaborate on critical decision making using videoconferencing.
Photo: Telecommunications Review.

Meanwhile the loss of doctors overseas, population growth, an aging population, and changes to the workforce were all contributing to the increased need for hundreds of new surgeons over the next 20 years, according to the College of Surgeons. The Royal Australasian College of Surgeons predicted surgery volumes would rise by 51 percent overall by 2026. It takes at least 13 years to train a surgeon – 6 years in medical school and a further 7 or 8 to complete their surgical education and training.[4]

ELDER ABUSE

Then three years after the fact Auckland Hospital accepted blame for a chain of errors that led to the death of Mervin McAlpine, 82, who died after being given the wrong drugs. He was a diabetic, who had already lost both his legs, when his GP sent him to hospital because he thought he wasn't coping at home. At the hospital, however, nobody asked him what medicines he was taking. His GP had faxed a one-page referral at roughly the same time another patient was being referred also by fax. The two fax sheets were

mistakenly stapled together and passed on to the house surgeon who gave McAlpine the wrong drugs, which caused his body to shut down. He died days later.

"We're accepting full responsibility for the failure to reconcile the medications at the end of the day," said Dr David Sage of the Auckland District Health Board. He said confusion was caused because the software used in GP referrals did not print a patient ID on faxes. The system had since been changed, however, he admitted while a lot more checks and balances had been put in place, the system was still not fail-safe. A national approach and a single medication list accessible to everyone would be a further improvement.

A report from the Health and Disability Commissioner pointed the blame squarely at Auckland Hospital and called for a nationwide response to develop a co-ordinated and consistent approach to make sure people got the right drugs. An audit at Auckland Hospital investigating the treatment of elderly people taking five or more medicines from December to March 2007 found 70 percent of them had more than one medicine listed incorrectly. Medical Association chairman Peter Foley said the medical workforce was under tremendous pressure and a smooth electronic interface was needed between GPs and their specialist colleagues, with more cross-checking.[5]

The fax farce only added to the pressure to move to widespread electronic communication of medical information. It was a political hot potato with National's Tony Ryall adding his voice to the blame game in Parliament in August 2007.

> *More and more patients languish on trolleys in hospital corridors, while the Labour government continues to ignore the crisis developing in our hospital emergency departments … Emergency departments are barometers for how well a whole hospital is doing, so the government should be very concerned about this crisis. Despite spending an extra $5 billion a year on health, none of the country's major hospitals are seeing emergency department patients soon enough. That's according to the government's own information. And none of those DHBs have met their targets for at least three years.*
>
> *More and more patients are coming forward with experiences of long and unacceptable waits in the emergency department at North Shore Hospital, including patients waiting up to 30 hours to get into a ward. How long you wait in a hospital emergency department has a direct bearing on how well any treatment will work. Sadly, everyone knows someone who has waited hours and hours to be seen at an ED. Yet the government waits for more reports and keeps giving excuses. The biggest problem is getting patients out of the ED and into a ward for treatment. Health Minister Pete Hodgson could fix delays in emergency care by trusting and involving health professionals, improving communication systems within hospitals, and improving after-hours GP care.*
>
> *With GPs threatening to withdraw from after-hours care in some parts of the country, this would put even greater pressure on A&E departments. Too much energy, money, and time is being spent on Labour covering its tracks, and not enough is finding its way to the front line.*[6]

A plan to barcode patients, medicines, and staff at public hospitals to reduce the risk of medical misadventure looked as though it would proceed. After all the government had set aside $10.2 million in the 2006 Budget to ensure there would be no funding hold-ups if the initiative went ahead, though the final cost of installing scanners and developing the back-end systems for hospital wards wasn't known. Based on the results of overseas studies, it had been estimated about 150 people a year might die in New Zealand each year as a result of prescribing errors. Between 1990 and 2006, 286 deaths in hospitals were linked to such errors, according to records filed by district health boards.

Health Minister Hodgson was urging the wider adoption of electronically readable barcodes

although he admitted barcoding could not be forced on hospitals. The plan was to give patients a barcoded wristband linked to their medical record when they entered hospital. Before medication was administered, a staff member would scan the patient's barcode and a barcode on their own staff identification tag and on the medication provided by the hospital pharmacy. This would ensure the right patient was getting the right drug at the right dose.[7]

BIG PICTURE STRATEGY

Guiding the way for health information system reforms was the August 2005 Health Information Strategy (HIS-NZ), which borrowed heavily from objectives first outlined in the 1996 strategy and the recommendations of the 2001 'Wave' report published by the Ministry of Health, which listed 79 ways to improve IT use within the health care sector. The revised HIS-NZ described a vision for vastly improved health information by 2008–2009. Community providers would be connected to a secure health information network, enabling seamless transfers of patients from one hospital or care provider to another. This would ensure information about medication, continued treatments and rehabilitation was more accurately and reliably relayed.

The five-year Health Strategy sought to close the gaps in existing data collections particularly in regard to community, primary care and outpatient services. It envisioned all health care providers having access to secure email, doctors being able to track and monitor the dispensing of prescriptions and laboratory tests, and ideally electronic prescribing between doctors and pharmacies. Electronic discharges would be 'ubiquitous,' so GPs and residential care providers always had current information about patients once they'd been discharged.

The preferred outcome was to replace the largely paper-based processes by which GPs ordered specialist consultations with a system allowing for electronic referrals. There was also a requirement that clinical information recorded when people received primary care providers or visited hospitals as outpatients could be more easily accessed, particularly by GPs. While work on each of these areas was ongoing it took two years after the strategy document was published for a business plan to articulate the detailed steps forward.

Several reviews of progress had been made along the way including concerns raised by the Auditor General in March 2006 and a report from management consultant and former HIS-NZ general manager Ray Delany. He pointed out that the author's of the Wave report hadn't examined the reasons why the proposed information strategies of the past were not implemented other than to suggest it largely stemmed from progressive under-funding. He said the report's writers seemed to be aware of potential problems when they said if recommendations weren't acted on rapidly, "the sector [would] be writing another large-scale sector information strategy in five years time."[8]

Delany said the Wave report reiterated issues outlined in earlier strategy documents, and noted the health sector was 'awash in strategy.' Then five years after its publication, although some progress had been made, the Office of the Auditor General expressed concern that this had been slower than anticipated and much work still remained to be done to fully implement the 'Wave' recommendations.[9] Delany said in June 2006, the New Zealand health system had been attempting to bridge gaps in information availability for years:

There is no consistent national data collection for primary care contacts or outpatient events, although projects to establish these are now underway. Gaps also exist in other areas: there is no electronic information regarding the state of wellness of the population, all the data that do exist are by-products of traditional treatment-of-illness models. Data on prescriptions and laboratory test ordering and information on other diagnostics do exist, but they are held in different systems that do not interface well and are

either coded inconsistently across the sector or not coded at all. This problem is exacerbated by the considerable variety of systems in use in public hospitals.

Nevertheless, a significant range of information was available. Practice management software was ubiquitous throughout the country for patient and practice administration. Approximately 80 percent of GPs were now using software for clinical purposes, such as the electronic generation of prescriptions and recording details of patient health encounters. Electronic claims from primary care providers number approximately 66 million per year, excluding Accident Compensation Corporation claims.

It is acknowledged that there are a number of problems and issues with all of this data. However, new developments will not necessarily solve these problems, as such developments take a great deal of time to deliver results … creating new information systems is difficult, and the cost involved and the risk of failure are high. All too often, existing sets of data are derided and bold attempts to create better data embarked upon, only to find that the new data has all the same problems as the old. Significant improvements in the measurement of health outcomes do not necessarily require extensive monetary investment. History has demonstrated that large investments in new information systems do not necessarily pay off as expected or that they show benefits only in the long term.[10]

Delany said researchers, clinicians, administrators, and educationalists must work together with skilled health information managers to achieve the best outcomes. "Experience indicates that where this multi-dimensional approach is used, the benefits are considerable. Many existing data sets are very useful sources of data that are currently underutilised. At the national level, New Zealand holds five years of mental health contact data, nearly eight years of laboratory tests, 14 years of pharmaceutical dispensing data, 20 years of hospital discharge information, 30-plus years of mortality data and over 50 years of cancer diagnoses. There are robust technology and governance mechanisms for protecting individual privacy while allowing analysis of these data to the most sophisticated degree. Few other countries in the developed world can boast as much. It is a national treasure and an epidemiologist's dream," said Delany.

EVOLVING HEALTH NETWORK

At the heart of the HIS-NZ and the flow of information around the health sector is the New Zealand Health Network (HealthNet), effectively a health intranet[11] linking hospitals and health care providers and embracing Telecom's SecureMe network for GPs and District Health Boards, and HealthLink's networks connecting GPs, pharmacies, laboratories, and radiologists. Following the Auditor General's report in March 2006 the Health Information Strategy Acton Committee (HISAC) streamlined and simplified the registration process for HealthNet, engaged with HealthLink and Telecom and was making it easier for health suppliers to understand the various network options. It had also accredited TelstraClear as a third provider and was working on seamless interconnection.

Key to the flow of data was the National Health Index (NHI), which assigns a unique code to each patient, linking clinical records. This had been continually enhanced over several years and was considered a world-leading breakthrough. To complement this the Health Strategy goal was for a single set of definitions for clinical and administrative terms between computer systems and that all 1500 GPs would have broadband access to data. Much of this was already in place before the strategy document was released. Work on an electronic Health Practitioner Index (HPI), a database that assigned a unique code to each clinician and administrator, had been underway since 2004 and was expected to be completed before the end of 2007.

Only 400 organisations were connected to HealthNet at the time of the report but this had grown to 1000 by late 2007 and was expected to reach at least 3000. HIS-NZ required that more information be made available electronically to GPs and that had been increasing steadily over the decade, especially relating to hospital visits. All GPs were using patient management systems and hooked up to HealthNet in some way, the vast majority on broadband. More than three million messages were sent from hospitals to GPs in 2007 with 18 out of 21 District Health Boards (DHBs) involved. Network provider HealthLink, for example, was providing connectivity for 3500 organisations including hospitals, laboratories, and radiologists with 40 million items of electronic information flowing around the health sector annually.

Following his contract as head of the Digital Strategy secretariat Peter Macaulay began work with the Ministry of Health on a three-month project to try to aggregate broadband use within the health sector to leverage a better deal from telecommunications carriers and to encourage investors to create networks where they were most needed. While the thinking in 2006 was around the creation of a single next generation health network (NGHN) the acronym soon became known as the 'not going to happen network.'

The Ministry of Health realised it didn't have the many millions of dollars required so Macaulay started work on a much simpler model. He began expanding on a 2004 interoperability model that required vendors to agree to work together and embrace common standards and guidelines; in this case specialised health sector security and the use of virtual private networking (VPN) where there was a need to transfer sensitive information.

If all the health applications and networks complied with the requirements they could be certified with the ConnectedHealth brand and given the green light to transfer health records and market their services to the 15,000 health providers around the country. This full commercial model would require no expenditure on the part of the Ministry of Health other than the cost of a small group to manage standards, branding, and some of the sales relationships.

While District Health Boards had their own views about how things should be done Macaulay said they had all signed up to ConnectedHealth in February 2007 and he had hoped by September or October to have the vendor interoperability model in place. "My aim was to have systems in place so vendors come up with enough high-speed wireless and fibre connectivity to considerably reduce the cost to health providers." If the three networks already under the umbrella of HealthNet used consistent standards they would already form the core of the ConnectedHealth model. The three-layered approach to connectivity; physical, logical and application, would mean everyone could communicate with everyone else on all layers. "HealthLink for example has an expensive but highly effective service but they needed to ensure they could connect to all other parts of the network. They were happy with that, but actually achieving it was the next stage," Macaulay said.

LOOKING FOR DIRECTION

The ConnectedHealth network could easily work in with the GSN and the proposed education network in order to aggregate demand. "If there was no high-speed connection into Gisborne for example you might be able to guarantee $600,000 to deliver health, education and government services. That should be enough incentive for someone to roll out fibre and be accredited as part of the ConnectedHealth network." While the GSN had already addressed connectivity and security at a high level, a third of all health providers were commercial suppliers so they couldn't use that network but it was thought there would be other opportunities for them to aggregate revenue streams. One of the major partners in the ongoing development was network giant Cisco.

The health sector would join education in 'leaning on the telcos' to provide New Zealand with decent broadband, said Brendan Kelly, chief advisor of HIS-NZ within the Ministry of Health. He told the Wellington Government Information Services conference in May that health was joining forces with education because broadband services were essential to both sectors. In particular, it put scarce specialist resources in touch with health service users nationwide. He didn't think it was unreasonable to have every GP on 10Mbit/sec and every hospital on 1Gbit/sec within the next five years. He believed the move to collaborate with the education sectors made sense as the two ministries performed two of the biggest public sector functions and most schools had a GP or other health provider in their immediate neighbourhood. The Ministry's vision of health saw it evolving from a sector to a system, where all the elements were connected, he said.[12]

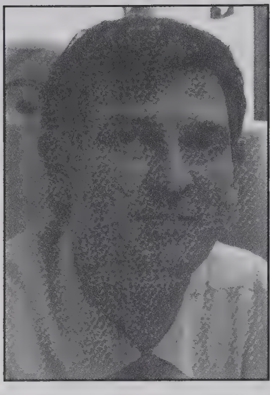
While everyone was now pointed in the same direction, Macaulay said it was still taking too long to get things done. The health sector had been working on a Privacy, Authentication, and Security Project (PAS) for a number of years. The Auditor General had commented on its slow progress although it was been claimed the arrival of new technologies including mobile and wireless computing required the framework to be revisited.

"The big issue with health is it seems to think technology has to behave differently for them than it does for everyone else, and that's nonsense. The issues are mainly around safety and privacy. The safety issue is no different from the safety and security of financial transactions that are done every day and the danger with privacy is that some health professionals seem to have gone so overboard nothing is good enough." He said those within the health sector willing to take risks were achieving huge things but it took so long to get through to those who were still locked into privacy and safety concerns that it was preventing innovation.

He said many of the existing hospital systems were antiquated, 'highly safe' or proprietary with no consideration for standards or how they might work with other systems. While Middlemore, Dunedin, and a number of other hospitals already had internal gigabit networks for moving large files like X-rays around, ConnectedHealth was focused on getting standards, and vendor arrangements in place for wide area connectivity between hospitals and out to GPs.

"We were ready to push ahead with the brand, standards, sales exercise and concurrent to that take feedback from across the health community on developing the new capabilities but we wanted to get a real live production network up and running first." At the close of his contract he was about to sign off on a supplier model but found the ground kept shifting. He tendered again to pick up on the next phase but the Ministry of Health opted instead to go back and consult with the wider health community on its perceived requirements. Macaulay insists there were no technological obstacles to the approach he had been championing, which was as applicable in health as it was in other sectors. "The technology is available, the obstacles are commercial and relate to a lack of investment, a lack of fibre infrastructure to achieve the connectivity and a mental block in terms of who pays for this."

As it was, he said, the Ministry of Health was 'spending money like you wouldn't believe' on a whole range of systems and processes. Running the existing HealthNet alone cost half a billion dollars a year. "If the technology was used properly it could improve the way the health system worked across all areas including ICT, business, and other systems. If they got their connectivity sorted out it could facilitate huge changes in the way people work across any of these areas and consequently bring huge savings. If someone is bought into A&E and is in no state to tell you what is going on you should have access to their health records to identify not to give them penicillin. At the moment there's no way to do that."



Dougal McKechnie, office manager for the independent HISAC secretariat.

RECYCLING THE FORMS

Dougal McKechnie, office manager for the independent HISAC secretariat, said one of the major issues was getting all 21 district health boards and other health providers to standardise their computer systems and software so everyone could share data. There were several relatively incompatible hospital management systems and five GP patient management systems in use across the country. He saw HISAC's role as championing new applications that complied with standards and looking at areas where applications still needed to be developed. "Some zones are more extensive than others, for example the four transactional zones around e-referrals, e-discharges and e-pharmacy are complicated and involve a diverse range of stakeholders."

Duplication of effort and incompatible systems across health boards and even inside hospitals themselves, however, remained a major obstacle, trapping valuable information in niche areas. Orion Systems[13] International chief executive Ian McRae said it was not uncommon for a medical facility the size of Auckland Hospital to have 200–300 departmental databases for a variety of useful research and other purposes that were not connected in any form. That meant information that could be valuable in the treatment of patients was unable to be shared.

After a six-month collaboration with Auckland Area Health Board in 2006, Orion came up with a 'genericised' Web-based clinical database solution, which opened up access to data from disparate sources. At last data could be stored in a consistent way so all departments had access. McRae said this would be particularly useful for hospitals that had, or were in the process of creating, major electronic records solutions for lab results, referrals, and discharges that had not previously addressed smaller departmental requirements. "We want doctors to make the right decisions about health, the medication people are on and historical lab tests so we get a far better picture of our health." The new system, based on the needs of hospitals across the country, was being trialled in mid-2006 ahead of worldwide release to meet pent-up demand in hospitals around the globe in late 2007.[14]

General practitioners typically received some form of notification when their patients left hospital. Most were doing this but in an unstructured form and it was often just a letter or email. Most referrals, confirmation, and subsequent communication concerning the patient were sent by post. Eight DHBs were receiving electronic referrals from GPs in 2007 but this was not standardised. To resolve the problems Hutt Hospital, in conjunction with three vendors, developed an electronic referral application for GPs referring patients to hospitals.

A good example of progress was the new forms-based eReferral application being rolled out across 30 general practices in the Hutt Hospital region. When a patient was sent for secondary care the GP simply pulled up an electronic form which was pre-populated in real time from the Medtech patient management system database, including current medication. Lab tests and any other data could be attached. The form was sent over the HealthLink secure health network, and once synchronised with the hospital's electronic patient records, a receipt was sent back to the GP. That messaging trail was maintained as the case was evaluated, prioritised, and acted on so everyone was kept in the loop. At each stage the specialist could write comments in the various fields and share these with the GP.

Tony Cooke, chief information officer at Hutt Hospital said there were 29 variations on the forms ranging from orthopaedic services to speech-therapy requirements. "GPs like it because it saves them typing in the data and specialists like it because they get a complete set of information."

The response from the coal face was that it was quicker, more reliable and made life easier. "The main thing is that referrals don't fall between the cracks which can have serious repercussions when things need to be addressed quickly." Potentially the new application could be used for internal hospital, GP to GP or referrals to physiotherapists or other community providers.

ACCOLADES FOR E-HEALTH

HealthLink chief executive Tom Bowden said New Zealand was now recognised as being world-leading – just behind Denmark – in terms of e-health and primary care communications. "We have the best communications between hospitals, specialists and GPs in the world. Our job is connecting GPs to everyone else in the health sector and our counterpart in Denmark says having everything automated is saving doctors 50 minutes a day."

HIS-NZrecommended health care providers track and monitor the dispensing of prescriptions and laboratory tests, with electronic prescribing between doctors and pharmacies. HealthLink had been working on a solution for pharmacies, similar to eReferrals. "We have a couple of hundred pharmacies connected to our network mainly for electronic claiming, and they are well positioned to go to the next stage." The secure email-based e-pharmacy application had been trialled in a closed pilot situation and couldn't be used in a wider context unless approval was given by the Director General of Health with exemptions under the Electronic Transactions Act, which had been applied for.

The Otago District Health Board received the go-ahead from the Ministry of Health in mid-August to begin testing electronic prescribing in 2008. Three boards in Auckland were investigating the way forward and had introduced computer systems that allowed hospital doctors to access virtually all of the state-funded laboratory tests results for their patients. Health Ministry manager of governance for district health board funding, Bruce Anderson, talked about a plan to spend $114 million over 12 years on new equipment and systems to improve drug administration and patient safety, including the proposed barcode system as part of a 'complex Web of computer changes.' He said electronic prescribing could save 1050 lives over that period, prevent 32,000 cases of disability, and save $115 million by reducing the additional time patients would have to remain in hospital through drug errors.[15]

Another example of how things could be streamlined came through the decision by Pharmac to develop its own on-line solution. The government medicines acquisitions and management agency requires doctors to have specific permission to prescribe certain types of medications. However until the end of 2006 its paper-based process for approval could take up to 20 days. That wasn't helpful if patients needed medication urgently. Now its on-line system, available through HealthNet, allowed practitioners to get almost instant approval.

Around the country secure, Internet-based solutions were starting to make life a lot easier, especially for those in regions where leading-edge innovations were being deployed. Doctors travelling throughout the sparsely populated West Coast district of the South Island were now able to take all their records and patient details and interact with other health centres and professionals, even in the smallest town. Hospital X-rays could be viewed across the region and blood test results given to patients within ten minutes of their analysis. The breakthrough was enabled through the West Coast District Health Board's Integrated Electronic Health Record (IEHR) project. "We can interact with patients at the same time because we have a common note. It's a lot easier for us to communicate as health professionals and deliver a service," said GP Greville Wood.

The DHB had installed a primary information systems management (PrISM) system across its 16 regional sites and a picture archiving and communications (PACS) digital radiology system, which meant the radiology department had gone filmless and now sent X-rays digitally. This was linked to an iSoft patient administration system and the MedTech GP practice software. CIO Wayne Champion,

who championed the IT overhaul, said computerising the clinics meant information could be shared, eliminating the need for separate paper-based records and allowing patient details to be seen across the region. Sharing data with other hospitals and radiology specialists also improved patient care. The DHB was looking to extend the system to dental and mobile health services.[16]

Wellington Hospital had also moved away from conventional X-ray films to the medical equivalent of a digital photo. Capital and Coast District Health Board's new digital system captured X-rays, CT scans, MRI scans, and ultrasounds in an electronic format and stored them in a central digital archive. The $4 million technology allowed doctors to view the images from any computer once they had logged into a secure system. The technology also allowed doctors to zoom and improve the quality of images on-screen. Health boards using the digital system could transfer and share medical images electronically once access and privacy issues were resolved. Capital and Coast's system was part of a regional plan with Hutt Valley, Wanganui and MidCentral boards, in various stages of introducing the technology.[17]

Another example of innovation in health was the Late Effects Assessment Programme Information Technology (LEAP IT) project, headed by Christchurch-based Dr Michael Sullivan of the National Paediatric Oncology Steering Group, who created an on-line clinical tool to manage children and young people who had completed cancer therapy. The Child Cancer Foundation sponsored the project with $600,000 over three years, resulting in health passports for young treatment survivors. The system allowed illnesses associated with the long-term effects of cancer treatments to be tracked throughout the life of the patient, leading to better care and understanding of their medical history and at the same time providing a research database to see which kinds of treatments and therapies produced the best results. The passports allowed young cancer survivors to move around the country and the world and take their medial histories with them should any issues arise in later life.

COMMUNITY HEALTH CARE

A critical component of the Health Information Strategy was the Primary Health Care Strategy (PHCS), including a new ICT framework for a more community-based health care. The strategy had been significantly revised since 2001, and would have far reaching consequences if it was followed through. It proposed a population-based health model with a more co-ordinated approach to health care, education and prevention. It would require a large investment in IT to ensure the sector was sufficiently connected but without duplicating existing investment. A 2007 report said people were already exposed to significant information about health and well-being, much of it over the Internet, but there was "limited access to trusted sources of information that was readily understandable by the public, and limited ability for people to have access to their own health records to maintain and track their own progress against goals."

The PHCS would give individuals more control over their health care and education and greater access to primary care providers. It would seek to reduce the need for repetition of tests and services, improve the efficiency of moving between providers so there was less need to for them to repeat information. It would reduce duplication of effort by enabling data to be captured once and then securely and appropriately seen where and when it was needed, thereby improving productivity and process efficiencies by automating common interactions. Costs would be reduced by using tests and other information collected elsewhere. Compliance costs for data submission would also be reduced.

Pacific leaders may be concerned obesity in their community is rising. With access to evidence-based population health data they can show this will result in greater incidence of cardiovascular disease and diabetes. Based on this information they could partner with their DHB and PHOs as well as working

directly with the community centre to develop a Pacific oriented cooking programme. A woman visiting her health provider for cardiovascular disease risk assessment could set care goals and plans electronically and show how her risk profile changes based on different decisions made in that plan. A woman having breastfeeding problems could look up on a Web-based directory where to get help in her local area. A patient wanting reassurance that palliative care services for her dying mother meet her cultural needs, would be able to access a resource on the Web in the community or over the phone to assess those services. A 20-year-old student with asthma, working with a community asthma group could review her medication instructions, treatment goals and future appointment schedule and electronically record the result on-line for care review and to track her progress.[18]

Greater access to population health information would enable those responsible for health, including community providers, clinicians, primary health organisations (PHOs), funders, planners, and policy makers, to make more informed decisions. An integrated view of data would be based on standard demographic profiles through the NHI, the Health Practitioner Index, clinical data community providers, general practice, and secondary care. The resulting population health profiles would support decision making and enable better identification of problem areas and planning; assisting in the management of immunisation, determining how many renal dialysis machines would be required over the next five years, identifying medication gaps for those at risk of cardiovascular disease, problem smoking areas, obesity, asthma, and whether diabetes screening programmes were working. New query-based tools would be required along with forums and electronic communities to support population health analysis including intervention information and learning, said the strategy document.

New Zealand is well positioned for population health because of the National Health Index (NHI), which includes basic demographics including deprivation based on address, and the recent development of the Health Practitioner Index (HPI). Continual work is happening to ensure these are strengthened and have integrity over time. Identifying populations of interest based on clinical data is under-developed as standards defining key clinical data sets and data items are not consistently applied or do not meet the needs of the sector. This results in clinical data being captured in an unstructured form and replicated in different ways in many places.

There are practices, PHOs and DHBs that are able to identify and examine aspects of their population's health profiles, but overall capability is mixed, in part because of the technical infrastructure needed and in part because of the limited expertise, time to undertake the analysis, and analytical capability. All parts of the sector are constrained in their ability to benchmark their populations against other like populations and to national comparisons because of the lack of data standards and connectivity. Understanding and predicting across the disease continuum is also constrained by the limited integration across settings, in particular community providers, general practices and secondary care.[19]

One issue underpinning all future developments is how the Ministry of Health's next generation national network, now known as ConnectedHealth, will shape up. It is expected to result in improved central health payment systems, better access to national data collections, and better information and connectivity. It's described in some documents as a global first but few specifics were available in 2007. According to Treasury documents the project, plus associated payment and business systems, were expected to proceed in two stages with stage one from July 2008 requiring additional capital funding of around $50 million and operating funding of $80 million over four years to around 2011.

However the architecture hadn't been decided and no one was saying whether it would operate independently, follow Macaulay's model of aggregating bandwidth across accredited providers and

vendors, or shift back to making the most of existing systems. Regardless HISAC in its caretaker role of existing networks was looking at how HealthNet might migrate to a new platform if it should become available.

As National Health spokesman Tony Ryall pointed out in October in-fighting between district health boards was jeopardising co-operation within the health sector and costing patients services. In a letter highlighting a breakdown in relationships between the country's two largest DHBs and umbrella body District Health Boards NZ, Ryall slammed 'the bureaucratic nightmare that Labour has imposed on the health system.' He said the 21 DHBs each had a strategy and vision for everything, duplicating huge amounts of work 21 times.[20] Like HISAC chairman Paul Cressey said earlier in the year, the challenge for district health boards was to "do it once and use it many times rather than doing it 21 different ways." The big, single database approach for individual health records was no longer supported. "Our approach is ensuring we have the right information at the right place at the right time, and that's at the point of care. It's more of a bottom-up approach with information from providers following patients as required."

In his October 2007 report on the Internet economy, researcher Paul Budde said the Western world was facing a massive dilemma in relation to health care. "New technologies are increasing life expectations and improving our lifestyle. The cost of this however is enormous, and we simply can no longer afford to finance these huge advances through the public health systems. In countries with proper broadband infrastructure we see e-health shaping up as a way that will allow us to enjoy these advances in medical technology and medical services, at a more affordable cost."[21]

If the DHBs were forced to co-operate rather than compete and the Health Information Strategy recommendations were fully implemented by the target date of 2010, our health care systems stood a good chance of full recovery. If e-health innovation at one DHB resulted in better diagnosis, faster decision making, more proactive patient care, and less crowded waiting rooms why wouldn't you roll it out to the nation? Real-time electronic messaging – transparent information sharing with health data following the patient on an as-needed basis across a secure network – would clearly result in greater efficiency, and less inconvenience for patients, ultimately freeing up huge funds for those cruelly overdue hip replacements, cataract operations, and cancer treatments. So why wouldn't you act now?

The vision of true e-health, identified well over a decade earlier, like many thousands of desperately ill New Zealanders, remained on an ever-expanding waiting list, needing urgent attention. The question remained whether the government continue to prop up the inefficient systems – technological and bureaucratic – of an earlier era, or move quickly to expedite the safe delivery of connected health and put us all out of our pain.

Outside the sandpit

Entering the e-learning era

Education is but part way through a massive revolution – millions of kids in many parts of the world now routinely use their school network as the means to download and upload homework assignments, enjoy virtual field trips and virtual international exchanges, and use the Internet as their primary means of research. In education there is of course a massive digital divide, not just among countries but within countries, New Zealand included.

TUANZ chief executive Ernie Newman, 2007[22]

It's been a bumpy 20-year ride, but after endless recommendations and reports the old school walls are finally coming down as leading-edge technology for teachers, administrators, and students is rolled out across the country. Education in New Zealand is undergoing a massive transition from chalkboards to whiteboards and paper mountains of administrivia to Internet-shared resources over a common infrastructure.

Internal school networks have largely been ramped up for the modern era, the use of computers in education is growing exponentially and a major effort has been made in recent years to get broadband into schools. Taking schools beyond dial-up to a minimum of 512kbit/sec was a major task that had been ignored until Project Probe provided the incentives for carriers to come up with a business plan. Some experts are now saying this hardly touched the problem, and gigabit speeds should be the goal to streamline access to a growing pool of e-learning tools and resources drastically needed to meet 21st century educational goals.

The education system, responsible for teaching and equipping a future workforce with appropriate skills for the world they have to survive in, has been slow to recognise the all-encompassing changes technology offers. One of the major obstacles, suggests educational IT specialist Laurence Zwimpfer, has been the Tomorrow's Schools strategy introduced in 1989, which gave schools individual control over the way they developed, with no idea of what 'tomorrow' looked like. While the intention was to make schools more innovative and flexible, and improve the quality of education through local governance and engaging parents, no one saw the computer revolution just around the corner or realised how networking these machines might change everything. At the time networking personal computers wasn't even on the government's agenda.

In fact a number of schools were being stung in their eagerness to get into technology from 1986 onwards with the likes of the infamous Ellis brothers and their company Computer Imports selling thousands of Exzel-branded IBM clone computers at 50 percent below dominant PC supplier IBM. IBM wasn't happy; neither were many of Computer Import's clients including schools, who faced hugely delayed deliveries or in some cases no deliveries at all. As for support, there wasn't any. The chaos took the courts many months to sort through, and after the company was sued by IBM for cloning its design it went into receivership late in 1988 and there was little the schools could do about their orphan or overdue machines.[23]

Streamlining education. St Kentergens students benefited from higher-speed broadband connections through Project Probe and with a wireless LAN in their classroom were able to escape from the spaghetti of cables normally associated with networking. Photo: Telecommunications Review.

EDUCATION ON REPORT

A number of reports, including those written by the Education Review Office, the Futures Trust for the government's ITAG, and the ITANZ, had recommended greater use of IT to improve information literacy. A recurring theme was a lack of a strategy. Schools could buy or were gifted computers and Internet connections on an ad hoc basis. A relatively low proportion of teachers had any IT training and if they did it was without any co-ordinated plan involving hardware, software, and support networks.

Technology education as a separate and identifiable

subject can be traced back to 1985 when director of education William Renwick called for a paper on technology education. The Beattie Report (1986) recommended greater funding in science and technology and stressed the economic and technological ends of education. In 1988–1989 a number of exploratory projects were developed in technology education; however, any real moves to action only gained ground after Lockwood Smith became minister of education. Two important influences in the process, which led to his seminal 1991 Budget statement, were Treasury, and the authors of the 'Porter Report' on the New Zealand economy.[24] The conclusion of the Porter report, that New Zealand must become more innovation driven, struck a sympathetic chord with Smith, reinforcing the economic policies Treasury was promoting to him. In his July 1991 statement, Smith outlined the need for: '...a clear policy to enhance educational achievement and skill development to meet the needs of a highly competitive, modern international economy ...' and a commitment 'for the modern, competitive world.'[25]

Across the sector there were a wide variety of initiatives, some initiated by government, some by companies and community groups, and others by schools themselves. Most were localised, and none were part of a comprehensive strategy designed to address all concerns of a school planning to implement IT more widely. Then in 1992 Prime Minister Jim Bolger woke up to the fact that the government should be using telecommunications in education. A handful of glossy reports pictured us leading the way into the 21st century with a highly skilled workforce. In reality we were importing more skills than ever before across a broad range of industries, and only a few measly million had been spent on practical projects to bring technology education into the real world.

Although Lockwood Smith had requested a technical curriculum in 1991, a draft statement wasn't devised in 1993 and it was then put out for further discussion, trials, and pilot schemes. It wasn't until 1995 that technology became part of the school curriculum.[26] The 80-page 'Technology in the New Zealand Curriculum'[27] publication was broad ranging, highly philosophical and the term 'technology' ranged across fields as diverse as graphics design, biotechnology, electronic and control technology, food technology, ICT, materials technology, production, and process technology. The term 'computer' was used 20 times and 'Internet' once.

The 1996 'Telecom Education Foundation' report revealed there was one computer for every 19 primary school students and every ten secondary students. Half the computers were more than three years old; 40 percent of primary school classrooms and 56 percent of secondary school classrooms had modems. Most schools intended to be connected to the Internet by 1998.[28] Education Minister Wyatt Creech and his predecessor Lockwood Smith had waxed liberally about the need to equip schools with technology and ensure students were ready for the brave new world. Maurice Williamson, however, insisted their approach required a radical rethink.

"Teachers want money for computers and software but they want to use technology in the old system. If business is going to automate you don't stay with old manual systems as well. You can't spend hundreds of millions getting information technology into education and still spend thousands of millions on the old regime." But why should it be up to the teachers, or even school boards for that matter? And expecting the private sector to cough up for everything, unless we were planning to privatise education, was a bit rich, he said.

In 1996 Telecom offered all schools a second telephone line at no charge. IBM, Apple and a host of technology companies contributed equipment, expertise, and time to get some schools on track. The communications industry rallied around to help 36 schools in Wellington install cabling in 1997, and for a couple of years schools were being targeted by vendors nationwide through NetDays. Surveys showed that cost and a lack of expertise in integrating telecommunications into the learning and teaching process were the main obstacles to providing technology in schools. Wealthier boards ensured their schools had nothing but the best but the less advantaged often struggled with the

basics, let alone how they might establish an Internet presence.[29]

In 1997 Maurice Williamson's ITAG, together with ITANZ, published 'Impact 2001: Learning with IT – The Issues,' which identified a number of problems affecting the ability of the New Zealand education sector to make use of IT. In 1998 ITAG consisting of 13 IT executives, academics, and other iterested in the impact of IT on society, presented the report proposing strategies for change.

ITAG wanted to lay a foundation for primary and secondary education to prepare for the knowledge society. If adopted this would mean all New Zealand schools would use wide area and local area IT networks for learning and administration. Teaching resource material relevant to all parts of the curriculum would be available on-line. Teachers would have ready access to technical IT and training support at no additional cost to their school. All teachers would be aware of the potential of IT in learning and have the equipment and skills to use it.

ITAG wanted schools to have adequate income to permit IT purchase and maintenance by 2000. All students would be taught information gathering and analysis skills using modern technology. Training programmes would be staffed by teachers who made appropriate use of information technology and were confident in the use of electronic information resources. All students would regularly use IT tools and information resources across a variety of curriculum subjects, and the potential of IT in special education and in teaching in te reo Maori was to be developed.

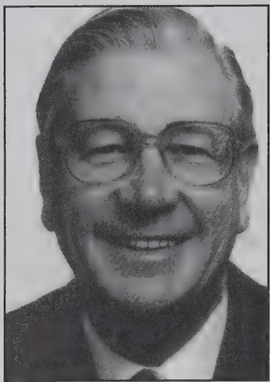
While most schools had Internet access at some level, it proposed wider access with local caching of commonly used resources to keep down costs. It questioned the exclusive use of paper from a variety of sources and encouraged the use of electronic resources. "It is not clear that government understands in any detail the changing information needs of schools, which makes it hard to determine the best way of meeting those needs. It would be reasonable to assume that almost all information going to and from schools could, and should, be delivered electronically, which would both improve its usefulness and save money."

ITAG proposed the government fund a web site containing resources useful to teachers which could be maintained centrally or in a distributed fashion. Contributions from all teachers would be encouraged. Resources might include lesson plans, curriculum materials, links to useful sites, and teacher-only discussion areas. "To some extent this is beginning to happen with the curriculum, teacher contracts and other material being made available on-line by the Ministry of Education. However it should in ITAG's view be formalised and resourced," said the Impact 2001 report.[30]

Auckland-based author and educator Gordon Dryden thought the government needed to invest a billion dollars in basic information technology, or $400,000 each for the country's schools. "There's a leadership void. There's no way we'll become the most skilled nation without spending money on technology. You can't get away from the fact there needs to be an initial cash injection from the government for basic technology and training." Teaching technology skills and having a technology infrastructure were no longer options but basics. Yet a piffling million dollars were made available for IT training and development of teachers for both 1998 and 1999. While the new national technology curriculum, devised over the six years, became mandatory in 1999, the country hadn't even begun to establish a national infrastructure to practice what we planned to teach.[31]

SOCIAL ENGINEERING

There were many vocal critics of technology education becoming compulsory in the New Zealand curriculum but most had misconceptions, said the IPENZ in its July 2001 report on the role of technology in education.



Gordon Dryden, founder of Radio Pacific, visionary, author of The New Learning Revolution and The Creative Revolution *and early-information-age advocate.*

In late 1999, the Newseum, a journalism museum in Virginia conducted a survey of American historians and journalists to determine the top 100 news stories of the 20th century. Of the top 100 headlines in the 20th Century, an estimated 45 percent were directly related to technology. What the public reads, hears, and values reflects a growing emphasis on technological literacy. For a society deeply dependent on technology, particularly in this knowledge age, we are largely ignorant about technological concepts and processes, and the factors that underpin technological development and innovation. In the past we have neglected technology education and this has led to a society that generally knows little about technology and engineering, and thus has little understanding of the potential of technology education in New Zealand schools…

A commonly held view is that 'technical education' should be seen as a vocational rather than academic subject, or one entirely concerned with skills rather than knowledge. Other mistaken views are that technology is only ICT, and that use of computers as an educational tool is technology education. These views in the community, and among principals, result in barriers to successful implementation. The Ministry of Education's focus has now moved to other curriculum areas as their new documents are released. Whilst the Ministry has attempted to continue to support implementation of technology education through various professional development opportunities, many schools have already shifted their focus to other issues, often to the neglect of technology.[32]

Education systems were still essentially training people for the industrial age and an urgent revolution in learning was needed if we were to make the most of the information revolution, warned futurist David Pearce Snyder, in the country in 2001 for the Ninth International Conference on Thinking. "In the industrial age people were mostly employed as extensions to physical machinery. In the information age we're all going to be using knowledge to do our jobs better. The fact is that 70 percent of the value added in the productive process comes from the information input – knowledge, design, skill, research and analysis."

He said only about 30 percent of the population could learn effectively in a passive, auditory mode by listening to a speaker; about 70 percent learned faster in an active applied setting. "The classroom only imparts real learning mastery to about one third of the graduating students. That was fine for the industrial age but now everyone is going to need those high-value skills. People learn faster by doing. Apprenticeship, internship, mentoring, community projects, teamwork, project assignments, team teaching and active learning is essential and has been shown to be so in the most successful innovative schools in the US and Europe."[33]

Education was going through a turbulent time. In July 2003 there were 2693 schools but dozens of smaller country schools, and those with rolls that hadn't been increasing, would close in the next few years. Teachers around the country were frustrated at the increasing demands on their time and were lobbying for better wages and conditions. In 2004 the Ministry of Education revised its strategy, admitting that the Internet would indeed transform the way the various agencies worked together and deliver their respective services. It put its weight behind the development of an ICT framework to guide the direction and co-ordinated use of ICT across the sector. It had 55 ICT-related projects to co-ordinate, many of which were e-government related.

The ministry had an 'audience-based' Web strategy with four key portals: LeadSpace for governance and administration information for school leaders; Te Kete Ipurangi (TKI), with bilingual information for teachers on curriculum; the education gazette and training courses, and content shared with Australia. Then there was Tertiary e-Learning (TEd), used by tertiary providers to access information, policies and complete data returns and e-learning for students, including course information and electronic delivery of courses.

The ministry was also developing software for education providers, including tools in the e-Admin programme for schools and early childhood education providers, designed to automate the collection of funding and staffing information. It was collating data from education providers to offer better access across the sector. A comprehensive redevelopment of internal information management systems was planned for 2005–2006, including a document management system that would enable better Web content management as well as enhanced software for the development of web sites and portals.

Between 2006 and 2010 learners and teachers were to be at the centre of their own communication and information networks. That meant making the best use of ICT across the curriculum to connect schools and communities, and support evidence-based decision making and practices in schools. Access to sustainable and well-supported ICT infrastructure in schools and across the education system was becoming fundamental. Through the ministry's e-Admin programme and initiatives from the NZQA, schools were increasingly carrying out core business processes electronically. This required an increase in the use of electronic student management systems. In the past there had been a wide range of incompatible systems and ad hoc timetable and contact management. From 2002 an accreditation programme would ensure they would all work together. The ministry funded 50 percent of the transition costs from proprietary systems to accredited student management systems.

TRUANT DETECTION

By December 2008 it was expected that 98 percent of state and state-integrated schools would be using accredited systems. This would give teachers, school administrators and managers, and education agencies better student management and information and deliver improved education outcomes. A central electronic register would replace the current paper-based exchange of enrolment data between schools, improving enrolment management. With such a system in place students not enrolled in a school within 20 days of leaving their previous school would be identified for the necessary attention.[34]

The e-Learning Action Plan, part of the overall 'ICT Strategic Framework for Education' published by the Ministry of Education in 2005, addressed the challenges facing the education sector as a whole. It was aligned with the e-Government Strategy and the Digital Strategy. The e-learning plan was built on two ICT strategies for schools: Interactive Education, established by the Ministry of Education in 1998, and Digital Horizons, launched in 2002. It included the work and priorities of schools and the Ministry of Education as well as other agencies, in particular, the National Library of New Zealand.

The foundations were being laid for effective and strategic use of ICT in schools by providing professional development for educators, appropriate on-line learning resources, the building of networks, the use of software and hardware, technical support and broadband access. While there were many examples of highly effective practices, these weren't yet fully embedded into everyday teaching practice either within or between schools, and changes in teaching practice were not yet systemic, said the action plan. The challenge was to ensure knowledge about effective teaching was

rapidly spread and adopted throughout the school system. "Just like the ability to read and write, ICT literacy will be an essential life skill – an economic and social necessity. Without ICT literacy, there is a risk that people will be cut off from job opportunities and unable to take part in the full life of the community."

Students would be supported in achieving their full potential through extending and enriching educational experiences across the curriculum as they became proficient in ICT literacy skills and developed the confidence and key competencies for independent, collaborative, and lifelong learning. Resources available to them included highly interactive digital learning objects, web sites such as *Te Ara: The Encyclopedia of New Zealand*, videoconferencing, CD-Roms, DVDs, and virtual field trips. Teachers could also use networked assessment data and tools such as asTTle (Assessment tool for teaching and learning) and the New Zealand Curriculum Exemplars.

To ensure schools could run this level of technology in their classrooms and share resources between classrooms and over the Internet the right infrastructure had to be in place. Like computing, the network capabilities of different schools across the country had evolved in an ad hoc manner. A Computer Network Survey of schools' infrastructure was carried out between June and December 2004 so the Ministry of Education could begin to prioritise upgrades. There were 36 pilot upgrades to evaluate the issues and test the proposed new standards, ahead of a wider roll-out.

TorqueIP, a specialist division of Connector Systems, was selected as the prime contractor to install cabling, switching and a server, aimed specifically at meeting the needs of small schools. Around 300 smaller schools with no network infrastructure were invited to apply to establish a network infrastructure. Each got a package deal: Molex certified cabling installation with a 20-year warranty, a 24-port Allied Telesyn Ethernet switch, an Acer server running a customised SUSE Linux operating system from Smart Computer Systems in Christchurch, system administrator training plus network design and project management of the installation. Work was due for completion at the end of 2006. Schools were expected to contribute a percentage towards the costs based on the size of their rolls. A school with 77 students, for example, would be required to contribute 20 percent of the total upgrade cost, typically \$4000–\$6500.

There was further funding for a second stage of 70 schools with rolls between 130 and 260, with little or no network infrastructure. This began in April 2007 and was due for completion at the end of the year. All up \$16 million had been set aside to upgrade about 400 school networks. Funding was also to be sought for additional assistance for upgrading school networks and ICT infrastructures in the 2008 Budget. One of the main issues arising from the Computer Network Survey of schools was the lack of proper design, particularly in small rural areas where many schools had been let down by sub–standard installations. Using Ministry of Education, recommended suppliers and certified installers ensured a high-quality network infrastructure.[35]

REMOTE LEARNING LINKS

Telecom and other carriers had steered well clear of moving into areas they considered unprofitable and that included the majority of schools in outlying or rural areas. Getting Internet at reasonable speed and cost was a challenge the MoE and the MED had tried to address earlier on. They were determined to find a way to deliver broadband Internet to all schools and provincial communities. The MoE wanted rural schools to have fast access to digital teaching resources located in the cities and offshore, with the objectives of 'improving administrative efficiency and teaching effectiveness, enhancing the professional development of teachers, expanding e-learning … and providing a wider curriculum choice and teacher expertise, including two-way videoconferencing.'

It had already explored the options with Telecom but received a lukewarm response, the

carrier believing provincial services were a financial liability. Its proposed budget of $28 million was also beyond the ministry's financial resources. The MED's complementary objectives were to strengthen the rural economy by giving local authorities, tourist organisations, the health sector, and businesses high-speed Internet, and generating a competitive telecommunications market outside the main cities. MED's concern was that provincial New Zealand's would languish without high-speed, price-competitive Internet access.

After 18 months of studying rural broadband needs, $39 million in funding for Project Probe (Provincial Broadband Extension) was allocated in the 2002 Budget, with the objective of ensuring that all 900 outlying or rural schools in New Zealand had access to broadband Internet services.

Although the original intention was that each project would be let by the Probe Steering Group (PSG), three regions: Southland, Northland, and Wairarapa-Tararua, proposed their own roll-out but still qualified for funds. Southland had been working on broadband access for the region for some time and as it was more advanced in its preparation it was first to go to tender, which was won by wireless carrier Woosh. Telecom then stepped up its game and began showing interest in delivering regional broadband. The roll-out of the Woosh network in Southland was seriously delayed as the company ran into major resource consent issues, and was forced to start from scratch, negotiating with local councils before it could roll out its infrastructure. Woosh came close to winning the contracts for Northland, Canterbury, and Wairarapa-Tararua but withdrew at the last moment, largely because of 'capacity constraints.'

Telecom moved quickly to take over all these contracts, proving it could provide the capacity with only incremental additions to its existing telephone infrastructure. Telecom's technology also proved cheaper to implement, which saved the project around $4 million. The company won all but three of the remaining projects; these went to Counties Power, Pacific.Net, and Iconz, which won the satellite contract. By December 2005 the use of videoconferencing had expanded rapidly, with 80 schools involved in delivering or receiving videoconferencing enhanced courses. In 2006, 130 courses were available.

The government debrief found a number of issues could have been managed better if the steering group had undertaken an earlier evaluation process and there had been more details in the planning documents. The Ministry of Education was constrained in its resources for preparing schools to add value to the services, and a lack of support programmes for videoconferencing also slowed the uptake. The report said there was an 'excessive expectation' of additional funding from local government. "Their planning and budget cycles were too slow and they were unable to allocate funds in sufficient time." The quality of input from the regions was highly variable and in some cases entirely inadequate. "This required a good deal of assistance by Probe staff, which cost the project as much as 12 months."

All but a couple of the contracts were completed on time, although the primary objectives – to provide broadband services to provincial schools, local government, and business interests and to generate a competitive IT environment – were completely achieved, the report concluded.[36]

Altogether 895 schools had been involved in Probe at a cost of $45 million and most had been completed by the end of 2005. The last Probe school to get connected, nearly two years after the official project closed, was Wakanui School in Canterbury. "It's good to get it. We'll be able to go on-line without using a phone line. Downloading information was so slow and the system would kick us off if we tried to watch video clips," said principal Mike Hill. Telecom had to install new access technology in the local exchange to extend DSL into the area which had two teachers and 46 pupils.[46] An estimated 60–70 schools across the country were still without high-speed Internet connections in August 2007 and the Ministry of Education was carrying out an audit to verify the details.

PIECING IT ALL TOGETHER

The next logical step was how to bring all those upgraded internal networks together by connecting schools and tertiary institutes to a nationwide high-speed network, to enable sharing and collaboration through the use of e-learning tools and Web-based resources. The ultimate goal was an open access schools network that met international standards, including access to a range of Web services that could adequately connect to the KAREN network, for access to higher research and education institutions.

Mark Horgan, senior programme advisor with the education sector ICT group, was committed to a single common infrastructure throughout the education system. He was appointed in late 2004 to work for the CEOs of the Education Sector ICT Standing Committee, to align services and ensure interoperability across the sector. The Education Sector Review, released in July 2005, had recommended the Ministry of Education, NZQA, and the Tertiary Education Commission work more closely together, reinforcing the concept of the 'virtual agency' with each agency contributing to the outcomes of the bigger picture.

Horgan, a knowledge management consultant with considerable offshore experience, said the move to upgrade internal networks across the nation's schools had resulted in a "surprising increase in the level of teacher confidence." They were now more comfortable that the technology would do what it was supposed to in the classroom. The implementation of The ICT Strategic Framework for Education would take things a step further, creating a strategic alignment from early childhood to tertiary through 'smart' use of ICT. Pivotal to this was the Education Sector Architecture Framework (ESAF), which would enable wider collaboration and sharing of resources across a nationwide network tentatively known as ConnectedEducation.

ConnectedEducation included a data model with common standards for information integration and exchanging and moving data across different platforms. There would be a search capability across local and international electronic catalogues, resources to make it easier to locate information. An Education Sector Authentication and Authorisation (ESAA) code for secure access would ultimately be extended so parents and caregivers could view their children's work and results.

The National Student Number (NSN) had been in place for year 10 to tertiary level students since the National Certificate of Educational Achievement (NCEA) was first introduced in 2002. The number was based on a National Student Index (NSI) database system maintained by the Ministry of Education to enable qualifications to be associated with each student. In mid-2006 legislation was passed allowing the number to extend to children from early childhood through to year 10 so students could be tracked through the whole school system for longitudinal analysis of their data. It was also foundational for shared services interconnectivity so student records could travel between schools and systems regardless of the vendor or student management system involved, and courses would be able to move between e-learning management systems.

ConnectedEducation would deliver a range of e-learning and Web-based resources including the Virtual Learning Network (VLN), a brokerage service based on a 'classrooms without walls' concept, where students and educators had flexibility to connect with their classes 24 hours a day, seven days a week. From the site a diverse range of courses, programmes, and activities were offered by New Zealand educators. The site brokered connections between teachers and learners, joining clusters, schools, groups, and individuals who were learning through on-line programmes, including videoconferencing for curriculum support.[38] Then there was the edCentre portal, a gateway to information about local education delivering access to educational services tools and resources, and advice for organisations and people at all stages of their learning lives.[39]

In September 2007 it was announced that $11 million would be made available through to 2010 for 122 schools to improve the quality of teaching through better use of technology. The

funding would go towards providing audio- and videoconferencing for Correspondence School on-line learning, developing school blogs and a technology expo. "E-learning strategies can place teachers and students at the centre of their own communication and information networks. This helps create a flexible system where teachers, schools and communities can identify the needs of learners and use technology to boost their achievement," said Education Minister Steve Maharey.[40]

Although the ConnectedEducation network was still at a conceptual stage, there was a close alignment with the ConnectedHealth initiative and the GSN, and the advanced KAREN network seemed a good fit under certain circumstances. With common standards and a willingness to embrace third party networks or suppliers, the goal was to extend fibre or other broadband links to all schools and agencies. It was hoped aggregation of requirements across health and education would encourage suppliers to make more of an effort to get to rural and remote areas, and close the gaps in and between the growing number of fibre loops around the country. Education would specify the levels of service and standards required, including security, so third parties could be certified to expand coverage. The broadband challenge and MUSH urban networks evolving across the country were ideal partners to help bring high-speed fibre networks to all locations where the four networks had potential clients.

PROBE NOT DEEP ENOUGH

While pleased with the success of Project Probe in extending networking to many outlying schools, Horgan described it as 'a lowband exercise'; Probe II would need to deliver a lot more. The darling of the education community, which had become a template for the way education would like to move forward, was 'The Loop,' a gigabit-speed community covering the top half of the South Island, which had grown outward from Nelson.

A loose initiative known as the Super Loop, an informal gathering of mainly educationalists, which wanted to ensure educational connectivity, occurred in an ordered way, taking lessons from Nelson and other locations where schools were accessing gigabit connections. The Ministry of Education was funding a series of reports and guidelines covering governance, business processes in funding, and internal technical issues including interoperability. "We don't want people developing solutions that will make it harder later on," said Murray Brown, the Ministry of Education's manager of e-learning. "We need to ensure various broadband networks around the country listen and learn from what various people have done over recent years so they're better prepared and don't go reinventing too many wheels."

Viable economic reasons were needed for investment in networks, including creating aggregated demand. "The Nelson situation was rather unique because the local lines company gifted spare broadband capacity and that's unlikely to be repeated in other parts of New Zealand. It needs a lot of collaboration and co-operation between local authorities, economic development agencies, education and other users. It is the sort of capacity and capability that many regional and local body agencies don't have a lot of skills in, so it's pretty challenging work."

Brown said the Broadband Challenge fund had been helpful in providing resources and support, and he was hopeful the reports from the Super Loop group would help with future decision making. People were starting to realise schools were important early users of new technologies, particularly in film, video, and multimedia where they were often higher capacity users than general business. A range of services and resources including videoconferencing, rich media objects and streaming video were already rolling out to schools over the public Internet but with the loops, speed, access and reliability were no longer issues.

There were now bulk arrangements for software licensing and purchasing, reduced compliance

costs, and new standards across networks and IT. Brown said government had been investing about $10 million a year in professional development for teachers over seven to eight years, including $18 million a year on 38,000 laptops for teachers. "It's been a matter of trying to get a balance between the things that can be done at the centre and what the schools need to take responsibility for. Certainly in the past decade we've had a more co-ordinated approach but up until then it was pretty much hands off," he admitted. The overall goal was to have the on-line resources and services available for teachers and kids in learning spaces wherever they are in that particular moment.

LOOP INSPIRES LEARNERS

Schools and colleges in Nelson's educational community achieved the utopian ideal of light-speed communication after developing one of the country's first open-access fibre networks which was viewed as a shining example for the rest of the sector.

In May 2005, as part of its Digital Strategy initiative, the government made a commitment to assist with the roll-out of fast and affordable broadband to provincial communities, including high-speed school networks. Such networks would support the education sector's projected demand for downloading graphics-intensive learning objects, two-way videoconferencing, and high-intensity classroom use. Small and remote schools in the Nelson region had struggled to keep up with the digital age. They either had poor quality network infrastructures or none at all.

In November 2005, a partnership between 13 schools, the Nelson Marlborough Institute of Technology (NMIT), Network Tasman, the Ministry of Education, and TorqueIP, the specialist networking division of Connector Systems, began collaborating on an educational community network for the Nelson region. Wayne Mackey, CEO of Network Tasman, which owned and operated the electricity distribution network in the wider Nelson and Tasman areas, had the idea back in 2000 that an advanced network would benefit schools and the local community, while generating revenues through the lease of fibre to business. "It's not that we were altruistic; it's that we believe education is a key factor for the development and success of our region," he explained.

Network Tasman visited a number of power companies in the United States to consider the network options and business models, as well as the pitfalls, opportunities, and financial risks. They agreed on a model that would require millions of dollars to be invested in laying 300km of dark fibre from Nelson to Richmond and Motueka, and on to Blenheim. Mackey approached the schools in the Nelson and Tasman areas with his idea; most were in full support and keen to help make it a reality, in particular Nayland College, Waimea College, and the NMIT. "Actually, it was more like a fantastic opportunity met a desperate need in an almighty bang, or a lovers' embrace," said Nayland College principal Charles Newton.

Network Tasman needed to connect fibre between key electrical sub stations from Nelson to Motueka and to improve communications for its alarm monitoring and control system. To make the deal viable, it needed an anchor tenant to lease half the fibre and minimize the risk. That's where TelstraClear stepped in. The Loop

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needed to offer a competitive alternative to commercial models by providing significantly cheaper, faster, more responsive, and more educationally valid digital services and resources. It had to be open-access and non-proprietary, serve potentially up to 20,000 concurrent users, and be able to offer a range of applications. With plans to widen the network to collaborate with other schools outside of the Nelson region, and to community-based initiatives, the design had to be scalable, secure, and sufficiently advanced to meet ongoing demands.

Getting all the schools in synch with the grand plan was also fraught with some technical challenges, such as reassigning all the public IP addresses to enable the schools to access the Internet. Adri Noordover, IT services team leader at NMIT, volunteered to work with APNIC to approve the reallocation of NMIT's 4000 IP addresses. Phil Earl, professional services manager of network integrator TorqueIP said it was a prominent project of a type that no one else had implemented before in New Zealand, and Nayland College in particular had done a magnificent job of understanding the needs and putting together a technical team to sort out the issues.

Nayland College principal Charles Newton undertook an extensive analysis of the ICT capabilities, commitment, and expectations of Nelson region schools, confirming that available commercial offerings could not meet existing needs, let alone future aspirations. "The analysis found that schools spent around $2 million per year on telecommunications for often inferior services. Our business case, based on overseas experiences, indicated significant potential savings depending on the level of uptake of Loop services."

The schools, NMIT, and Network Tasman put the project out to tender. The first stage would connect 12 schools to the fibre and demonstrate proof of concept. The MED and Network Tasman jointly funded this. TorqueIP and Allied Telesis won the contract. The 10 gigabit Ethernet network designed by TorqueIP featured six Allied Telesis core multilayer switches delivering quality of service (QoS) for maximum availability of voice, video, and data services, with layer three switches at all edge sites. NMIT housed part of the core Loop infrastructure with a fibre link to the Wellington Exchange.

The network was able to deliver fast Internet access, videoconferencing, IP radio stations, IPTV, streaming video, off-site back-up, IP security cameras, content filtering, remote access for teachers and students, centralised file servers for data storage, and virtual LANs. By mid-2005 it was clear The Loop could adequately cope with two video-conferences, streaming video, VoIP, security cameras, Internet, and DVDs going back and forth over the fibre simultaneously, with nothing going through a telecommunications carrier. The next stage in 2006 was to take The Loop to about 50 schools through a combination of fibre and wireless networks.

It was planned to link The Loop into the NMIR MUSH initiative, part of the successful Broadband Challenge project for the Nelson Marlborough Info Region championed by the Economic Development Agencies of Marlborough and Nelson. "Our aim is for the Loop to operate as a self-funding and self-sustaining commercial concern, and be a vehicle through which all interested educational and business interests can seek synergies rather than replication and competition," said

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Newton.

"One of the difficulties of ICT infrastructure development in New Zealand schools has been the lack of robust and tested models. Through trial and tribulation we now have a model for that next big step up in ICT sophistication, where school's capacity will grow through regional, cross-sector collaboration. It's about people working together to solve problems and defeat barriers. The Loop is one of the first networks being set up in the new paradigm: open-access, IP, and uniquely collaborative."[41]

The Loop, which was serving 19 schools across the top of the South Island by 2007, won the *Computerworld* Award for Excellence in the use of ICT in Education. Adri Noordover from NMIT said there was still much more to come. "The current implementation is only uncovering and using a fraction of the power of the technical capabilities available to us."

NMIT housed of one of the core network nodes, and the connection to Wellington, allowing traffic to cross between Nelson and Blenheim on its fibre link, and sharing the use of the NMIT Online learning management system hosted in Wellington. It was also hosting the Learning on the Loop web site,[42] which featured a range of on-line tools that could be used to support class-based activities as well as fully on-line courses.

Noordover said plans to expand included developing a Super Loop, enabling even more schools around New Zealand to connect, and having The Loop join KAREN, which would allow wider local and international connections for collaborative research and education. NMIT chief executive Tony Gray said The Loop was still just the tip of the iceberg in terms of increasing connectivity between education providers. "There's incredible potential to expand our information networks across New Zealand and the world. With the addition of KAREN, for example, we will be able to look at helping our secondary and tertiary students access a whole world of knowledge, quickly and simply. The technology that will allow our young people to be on a par with the rest of the world, and it's not far off."[43]

The first steps to expansion would be with six inner-city Wellington schools thanks to a $400,000 grant from the government's Digital Strategy Community Partnership Fund. The Wellington Loop Project, supported by Contact Energy, WCC, and fibre provider CityLink, would provide the infrastructure. Laurence Zwimpfer, chairman of the Wellington Loop steering committee, said the project, first discussed in 2004, aimed to create a shared environment for on-line student learning. "We are creating a new virtual environment for schools – one that shares IT facilities like servers and allows unfettered Internet access." He said the level of connectivity would have been impossible using established commercial broadband offerings.

CityLink managing director Neil de Wit said the schools would be provided with a dedicated gigabit network. "It will provide as much connectivity between any or all users as required. There will be no constraint on bandwidth." The next big challenge would be to link in Wellington's other 200 schools.[44] Similar gigabit speed networks, stimulated by Broadband Challenge funding, were underway around the country including Auckland's North Shore, Auckland City, Christchurch, Wellington, and Waikato.

Education networking specialist Laurence Zwimpfer said schools had been encouraged to head down the IT path, but most hadn't been given the tools to do this. They were trying to run fairly sophisticated businesses with a large, demanding body of students and teachers, but IT was often seen as an interesting add-on that didn't quite fit the school curriculum. "The reality is IT is now a critical component in running our schools – even more critical in terms of giving kids the sort of education they need, yet we're still running it in a fragmented way on a shoestring budget."

Laurence Zwimpfer, who wrote numerous reports to government from the 1980s onward was still at the forefront pushing for a better competitive bandwidth deal across a range of sectors in 2007.

What was needed was a similar approach to the GSN; in other words a highly secure, high-speed nationwide network backbone all agencies and schools could hook into for shared access to resources. "I took the idea of a school network to former education minister Lockwood Smith in my days at Telecom, thinking this was an offer he couldn't refuse. He said I would have to go out and sell it to all the schools individually and at that stage there were about 2700 schools. I worked out how long that would take me and figured I'd be long gone by then."

Zwimpfer said a much broader vision for what could be achieved with technology in the education sector was needed. While Project Probe solved many problems and gave everyone the opportunity to connect, the next mission should be to scale that up hundredfold. He said the government-funded multi-gigabit KAREN network, serving the nation's universities and Crown research institutes was a good example of what could be achieved for other sectors. "Local authorities, health and education need access to bandwidth like they need access to a building. You need different pricing models and the telco world has been slow to recognise that."

He said a network of 2700 schools is not big in global terms, and a big picture vision for all schools to become part of such an approach was necessary. There had been progress in some areas, but the roll-out of fibre-optic loops to urban areas in Nelson, Christchurch, Auckland, North Shore, and Wellington had been painfully slow. While Project Probe was supposed to be the catalyst to involve entire communities, once the schools got connected, the incentive was not there, particularly if the schools only had 512kbit/sec connections.

CONNECTING COMMUNITIES

The next stage needed to take into account what was happening in the wider community. "There wasn't enough thinking about how the capacity would be locally reticulated. It was a bit like what New Zealand did in the Pacific Islands in the 1970s. We put in satellite dishes in one location and told – they were now part of the 21st century but no thought was given about how they were going to provide a service to other parts of the island or other islands within the group; 30 years on we still haven't solved that problem." Zwimpfer said the country was at risk of doing the same thing with schools. The government was still saying, "Look, we've put in a broadband connection into a school in your community, so what's your problem?"

The closest thing to a solution, he suggests, is exemplified by the service provided by Waikato University to the Tuhoe people in the foothills of the Urewera Ranges, connecting their school hubs and consequently local homes in the community using 'good old wi-fi.' "It's a very bottom-

Prime Minister Helen Clark handing Laurence Zwimpfer an Excellence Award at the 2006 IPENZ Awards, Te Papa, Wellington for his untiring devotion to progressing ICT and engineering. Zwimpfer was co author of Teletext and Videotex in the United States *(McGraw Hill 1982) which laid out much of the application theory for the widespread adoption of the Internet. Peter Isaac Archive.*

up, community-owned process that certainly didn't get a lot of help or engagement from the telcos. That's not necessarily a bad thing because you end up with another model of locally owned fixed price infrastructure rather than a user-pays one."

That solution was partially funded by the CPF, promoted by the 20/20 Communications Trust, of which Zwimpfer is a member, and owned by the Tuhoe Education Authority. "If Telecom had tried to go in there and put up repeater stations on sacred mountains they'd probably still be negotiating resource consent and opposition from the locals; instead the community couldn't have been more helpful because they have ownership and can see the immediate benefits."

Zwimpfer said many city schools were now on a gigabit path where they could collaborate and share resources, run shared server farms, and potentially connect into KAREN and internationally. "This is happening in the city areas where we've got fibre but it is creating the same sort of gap we had five years ago between the city schools with their 512kbit/sec connections and the rural schools with a dial-up 24kbit/sec connection, if they were lucky. We need to run the Probe process again because the market is not suddenly going to put huge investment into Ruatoria and other remote areas. We don't want to wait another ten years until everyone is screaming again; we need the government to come in, make the decisions now and get on with the investment."

It was essential to keep the gap from widening, otherwise there would be major problems ahead for education. "We already have this situation where some kids are getting access to a whole range of sophisticated opportunities and others are not. Some schools are able to run more efficiently; for example in Wellington, where they are moving to professionally managed and backed-up shared server farms. This means they can get rid of their own server infrastructure, which they have been trying to manage with meagre resources, while paying technicians a fraction of what they might earn in the commercial world."

In the United States about 25 states had developed their own Internet-based curriculum, and about one third or 6000 public schools were offering credits for on-line classes, according to the US Department of Education. An estimated 700,000 students took these. Marc Prensky, a New York trainer, educational games developer, and visionary[45] who spoke at the International Confederation of Principals in Auckland in April 2007, said for the first time schools had serious competition.

"Today's education is bifurcating. There's the school with its certificates, and outside school there's another world, an on-line world, that kids find exciting. Here they learn without us. They're highly motivated. They work with peers. Things actually happen. The only way for schools to compete is to involve students with everything. We can no longer just tell students what is right or best. We have to ask them what they think … Have kids' representatives at parents' nights and faculty meetings; take them to conferences. I'm talking smart kids who will give their point of view. We have to involve students in everything we do."

Prensky, who has created more than 50 educational games, said games were the paradigm for learning with engagement. "Complex games that take time to play, involve lots of skill, goals, learning and decision making. How come in a class of 45 minutes students haven't made 50-100 decisions and got feedback? In a game you make them every half second ... The goals in class are 'do this'; the goals in games are always 'be a hero' ... there's a definite motivation there."

COMPUTING THE KEY

His response to people who throw their hands up in the air and say, "The future is going to be so different, what are we going to do? We don't even know what people's jobs are going to be," is, "Well that's true for 100 years time – but when these kids grow up they're going to be interacting with others via technology. No matter what the job they have, they're going to be connected by some kind of computers. Its stuff you don't have to be a tremendous seer to predict but we're not teaching any of that ... Kids used to grow up in the dark. When they went to school, teachers gradually showed them the light. That's what was so noble about our profession. But today kids grow up in the light – they learn what's going on from the Internet and TV, and they have cellphones. Teachers don't want to engage with the kids on different stuff; they want to engage the kids on old stuff. So we've got a real problem with school becoming less and less relevant. Even with the best intentions we put them back in the dark."

So what was his vision for education? asked *Interface* editor Greg Adams. "It's about everybody reaching their potential ... That means the ability to go in the directions that inspire or interest someone, but to be guided at the same time, to work with peers, to follow your heart and your instincts, and basically have a good time growing up. Not everyone's going to be an intellectual person, but people should, at the very least, not be afraid of learning. Everybody has interests and should be able to know that they can follow those and find others who share those interests. Somebody said it really is not the knowledge revolution, it's the connectivity revolution. The more we help young people understand how exciting it is to get involved the better. We're in such interesting times to grow up in."[46]

Meanwhile there remained concerns about future funding to expand technology use in schools after Telecom pulled out of a 14-year deal that saw a small percentage of parents' phone bills go towards increasing the digital capabilities of primary and secondary schools. The School Connection sponsorship programme had raised $120 million over that period and left many poorer schools in particular wondering how to replace what often amounted to tens of thousands of dollars from their already stretched budgets. If that wasn't enough it was announced in September that it had cost parents close to $54 million more in 2006 to provide additional computer equipment and other essentials for schools. Through fundraising $80 million had been raised, up from $65 million in 2005. The 30 percent hike in funds from parent donations and school fundraisers was mostly raised at fairs, auctions, and gala balls and went on running sports and music programmes after school, some building work and scholarships. Parents had already given $155 million in fees during 2006, a $40 million increase from 2005.

National Party education spokesperson Katherine Rich said communities were under constant pressure to contribute to 'free education.' School Trustees Association president Lorraine Kerr said parents had traditionally raised money for the 'nice to haves' but were now helping to buy necessities. "I think it's pretty poor that parents have to dig deep to subsidise what is supposedly their right." She said the government had spent about $60 million on information and communications technologies in schools. "But we also know that parents have had to raise another $10 million to top that up." School principals said they had to use a range of methods to supplement public money and provide extra resources.[47]

Meanwhile the way the government allocated funding to schools was also clearly out of step with how many smaller communities operated. For example Apiti School in the outback of north-west Manawatu was savaged by a huge reduction in per child funding from around $96 to $22 per child in 2008.

It was one of 14 schools in the country to face a change in decile status by the Ministry of Education based on old census figures, which Apiti principal Mary Cumming could only put down to the loss of one family in 2006. Since then the school had added two large families, which meant it now had to cope with more children than previously with less funding. A number of schools appealed.[48]

BUILDING CAPABILITY

As far as Internet pioneer John Hine was concerned, the greatest need in the education sector from primary through to secondary and tertiary was to continue to build capability, an area where persistence made all the difference. He was on the board at Wellington Girls College when the laptops for teachers programme was introduced, and helped start the Tech Angels programme where students show teachers how to use the technology.

"I was just amazed how that school changed in three years. In the first year you could point to teachers putting the laptop in their bottom drawers and wondering why they had been given it. In the second year they were preparing their assignments on it, and the third year the students were using laptops in their classes. We saw foreign language students reading foreign newspapers on-line from their laptops, and a German or French article projected on a big screen for discussion. Those changes happened pretty quickly. Once the equipment was there it took a bit of willpower, and a clear vision to make sure teachers didn't forget what they should be doing with these laptops. That sort of thing has to happen in schools all over the place and it has to stick."

The risk, he said, was if the person who had been driving the technology moved on, a programme could flounder. "You really have to keep developing that capability," said Hine. Similarly, he said, the uptake of technology in health could make a major difference in the way things were done, but that would require finding a way of getting past the issues of privacy and sharing personal information. "There's a lot to be gained in the health sector; for example when you realise that something like 30 percent of the health budget in 2006 was spent on fixing things that were going wrong. If you can reduce that you can put more money into more operations." In the end he said people needed to have confidence, they needed to see how secure a successful banking operation keeps its customer information, and how this might impact on other sectors.

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IP channel surfing

Digital vision evolving

> We're going through an evolution. All phone companies are becoming Internet companies, all Internet companies are becoming phone companies and in a couple of years we'll all be TV companies as well. Companies that do triple play with a single billing relationship and bundled services will have an advantage long-term. I can't see that not happening.
> Seeby Woodhouse, Orcon, 2006

The visual media landscape was being challenged by revolutions at all ends of the spectrum from wider, flatter screens, and the imminent arrival of HDTV in the lounge, to the trend for lighter, slimmer phones that doubled as cameras with viewers for MTV music clips, movies, and mobisodes of the latest soapies.

It was expected that by 2015, 90 percent of all households in the developed world would have a home media centre managing digital voice, data, and video content and services. The uptake of media centre PCs would be driven by TV operators, telecommunications companies, ISPs, and consumer electronics businesses, all hungry for a slice of the new digital home entertainment business, according to Paul Budde's 2006 Global Digital Media report.

On a trip to Paris on Singapore Airlines early in 2005, I gained a first-hand insight into the capabilities of on-demand media with an in-flight entertainment system delivering a smorgasbord of content. Halfway through a bad movie it dawned on me that I was no longer at the mercy of a programmer. I could stop, rewind, fast-forward, or pause any of the 60 movies; many of them still at the box office in New Zealand, and browse a host of other content at my leisure. And that was all on six-year-old technology. Soon after that flight Air New Zealand launched a similar service on its new 777 aircraft promising 50 blockbusters, classic and children's movies, and a similar number of TV shows and documentaries plus a wide selection of music and games.

Sky TV had the digital pay-TV market to itself while free-to-air broadcasters weren't even at the starting gate despite years of discussion about how they might transition to digital. Competition for that prime space was the focus of increasingly fierce marketing, as the walls between computing, telecommunications, and broadcasting began crumbling. All indications were that if the broadcasters didn't wake up, Telecom, TelstraClear, and ISPs would start delivering on-demand or downloadable video and beat them at their own game.

New generation DVD recorders and hard disk-based personal video recorders (PVRs) could record over 100 of hours of programming to play back at your leisure. Xbox and PlayStation gaming machines not only played and recorded DVDs and delivered on-line gaming but also had huge hard disk capacity. New 'media centre' software allowed users far greater control over their entertainment options, and the imminent arrival of IPTV, which all the big telcos were beginning to drool over, threatened to reshape the entire viewing experience.

On its own the Internet was delivering an increasingly richer experience and people were spending far more time exploring the options. There were thousands of sites where music, movies, and TV programmes could be legally downloaded, and a host of niche channels you could stream to your computer or flat-screen TV. Free Internet in France had come up with a business model with a feel of the future. It had installed its own equipment on France Telecom's local loop and was providing 20Mbit/sec fast Internet, phone services, and free calling to much of Europe with no line rental charges plus 100 TV channels, with video-on-demand at $4 a pop. Subscribers got a wireless router with a hard drive to store content and could buy a mobile wi-fi handset for calls in their home and at external wi-fi hotspots. The entire bundle had no data cap and cost NZ$57 a month.

HomeChoice in the UK and Fast Web in Italy had similar deals and Yahoo! Broadband in Japan delivered triple play services at 100Mbit/sec speeds. In Australia ABC and Disney were offering the latest episodes of *Lost* and *Desperate Housewives* on their web site the next day for $1.99 each, or free for streaming if you didn't mind the ads. The TV download service was available to anyone, including Kiwi viewers.[1]

In its 2007 report on trends and developments in the UK communications market UK telecommunications regulator Ofcom said broadband use had skyrocketed since the local loop had been unbundled and as a consequence digital TV over the Internet had overtaken satellite broadcasting. More than 50 percent of UK households had broadband. "Different platforms offer competing services with digital TV, satellite, cable and IPTV and telecomms operators eating into each others' space to the benefit of the end users lured by increasingly attractive bundles," said market research company Ovum.

As a result, more than 40 percent of households now took a bundle of more than one communication service – double the EU average. "All traditional terrestrial platforms have now diversified their offer onto digital and/or Internet-based on-demand services. Digital terrestrial television now has more viewers than satellite, with a staggering 80 percent penetration," the report said. And according to Ovum, the social networking boom meant Brits now spent 29 hours a month on the Internet, using broadband connections with average speeds of 4.6Mbit/s (nominal). They mostly read news and socialised, with eBay, the BBC, Facebook, MySpace, and YouTube amongst the ten most visited sites."[2]

REAR VISION MIRROR

The first hint of digital television becoming a reality for New Zealand's free-to-air broadcasters came late in 1997. BCL, the State-owned infrastructure company that managed the towers and the distribution of signal for most radio and TV in the country had been trialling new technology and said it could be ready by the end of 1998. BCL rebroadcast TV2 for ten days in digital format to a van moving around Auckland streets to test signal strength and picture quality. It used equipment from UK-based manufacturer NDS and a standard UHF transmitter at Waiatarua in the Waitakere ranges broadcasting to a prototype set-top box in the van. "We will be doing more digital trials this year and launching digital television for all the free-to-air broadcasters as early as the third or fourth quarter," were the confident words from BCL general manager of networks Rob Sweet.

"It was easier than we thought. It proved that digital reduces reception problems and provides a better quality picture especially on bigger screens. We had two 29-inch Panasonic TV sets side by side showing analogue and digital. You could see there was a significant improvement," said Sweet. Digital opened the way for more channel choice. The set-top box would also have a plug for a phone service as a return channel which could be used for Internet access, for example. BCL was gearing up to simulcast both analogue and digital television. The set-top box would be an interim solution for existing television users during the transition to digital TV sets.[3]

Photo: Hewlett-Packard

The only obstacle according to BCL was the availability of commercial quantities of digital video broadcast (DVB) chips for set-top boxes but at broadcaster level there was another more pressing issue to be sorted out. The industry had been lobbying for several years to have the government free up Crown-managed radio spectrum to make room for digital television. There was only enough spectrum available for the existing free-to-air channels and Sky to simulcast existing programming. Nothing had been set aside for new players, growth in the number of channels or interactive or fast Internet services. Sky owned four national frequency sets, BCL, the TAB, and Prime Television had one each and the government had two. The Crown-managed channels and adjacent frequencies were the only ones left for digital.

The rest of the world was moving rapidly into the digital space and TVNZ-owned BCL had been experimenting with digital broadcasting but without spectrum there was only uncertainty ahead. Rob Sweet said an important part of the digital television trials in Auckland was to extend the number of channels that might fit into the maximum spectrum available. "If this doesn't work we're in trouble. This issue has to be dealt with … There's not enough spectrum for Internet and interactive services such as home shopping and banking or more pay or free- to-air television." Meanwhile the Ministry of Commerce had received a number of submissions requesting more spectrum and legislation and ways to free up spectrum were being looked at.[4]

With little in the way of leadership from the government, bewildered broadcasters were trying to determine how to convert to digital with sufficient added value to take their audiences with them and still end up paying their way. The transition to digital was expected to cost the free- to-air channels tens of millions of dollars not only in converting their networks and transmitters but also swapping users to new set-top boxes. In 1999 an independent evaluation by the Institute of Economic Research suggested it would add at least $150 million to overall operating costs for free-to-air broadcasters over ten years. The New Zealand Broadcasters Council, which comprised TVNZ, TV3, Sky, Prime, and the TAB, had been working on a shared strategy for digital but was still in the early stages.

COITUS INTERRUPTUS

Pioneering ISP Ihug remained determined to add TV and video to its offerings any way that it could. Back in 1999 it was engaged in serious set-top box software development promising to deliver up to 42 channels via satellite. In May 1999 Sky TV proposed to take a 30 percent shareholding believing there was a synergy in their digital strategies. Price, however, was an issue, as was the way forward. Ihug had already launched its own high-speed satellite-based Internet service. Initial uptake was slow, with only about 600 customers, however, director Nick Wood said that number was soon in its

thousands. The digital TV service which would 'blow the rest of them out of the water' had been in a holding pattern until discussions were completed with new partner Sky.[5] By November the deal was over.

The merger fell apart through conflicting business plans and some said unrealistic demands by the Wood brothers. All that remained of the digital TV plans at the end of 2003 was a pay-per-view system in a few hotels and motels. The digital TV transmitter and remaining boxes were gathering dust in the Ihug basement. Then in February 2000 Ihug tried to get into bed with cinema owner Force Corporation but that too failed to be consummated. Then it purchased 51 percent of video chain Video Ezy but sold its shareholding back to the original owners a year later.

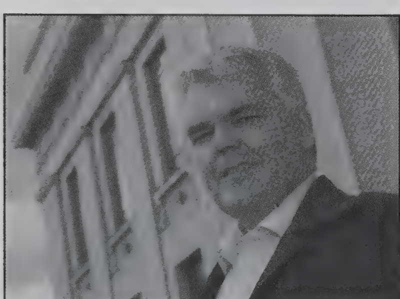
Ihug tried another approach in November 2000 aimed at delivering Internet access to those who didn't want a PC. Its Ihug Surfboard with infrared-connected keyboard was previously only available in hotels plugged into the TV set, enabling those with no PC skills to surf the net on the TV screen, and download or send email. The device had picture within picture (PnP) so viewers wouldn't miss their favourite programmes while on the Internet.[6]

"The Ihug Surfboard will be perfect for newcomers. It will have special appeal for the many seniors who are increasingly interested in email as a way of contacting young relatives. People with little or no computer experience have been up and running in minutes," said Ihug director Tim Wood in a press release in November 2000.

Early in 2004 Ihug's general manager of sales and marketing Duncan Shand conceded that without access to unbundled DSL services at 256kbit/sec and higher there was little incentive for ISPs to develop relationships with content providers or deliver other value-added products.

"We're trying to help customers use more intensive content but we can only do this on the JetStream starter package, even then the customer has to pay $29 to Telecom on top of the ISP fee so it's still pretty ugly." It was impossible to compete against Sky without higher speed when ISPs and customers were charged by the megabyte. While the flat-rate 128kbit/sec JetStream starter package invoked a sense of déjà vu from the ISP that toppled the dial-up Internet charging model in 1996 it wasn't sufficient to get Ihug back into providing video services. "We never really had the marketing muscle to drive our IDTV offering. Sky lost millions getting their service to profitability but we didn't have that kind of resource behind us. It was just too hard," said Shand.[7]

Iconz research and development manager John Russell also believed Telecom's pricing of DSL was the biggest show stopper for deployment of broadband services. "With an uncapped higher throughput service there's a thousand things that will suddenly become available." In early 2004 Iconz was talking to a number of content providers with the idea of having time-shifted channels with specific movies and TV shows, live video, multicast events, and video from static points including traffic feeds.



Nick Wood, who along with his brother Tim founded pioneering ISP Ihug.

It was in the process of making a substantial investment in database technology for interactive searching and constructing billing models. Set-top boxes were also in the plan. "We see ourselves as a partner. Every effort will be made to keep this open so we can integrate with other people's services … a channel partner for mainstream broadcasters … We'll provide a whole new delivery method and revenue stream for their content," said Russell. A major announcement was expected before the end of the year.[8] Within a year it was all over.

Iconz had been forced to back off by Telecom's Internet access charges despite being confident the

technology and the business case were there. "If the market had opted for unbundling the local loop we would probably be delivering a service by now," said Russell. At the time Telecom had just been given the nudge by the Commerce Commission to share 2Mbit/sec streams with the other ISPs. Even then it was 'still absurdly expensive and hard to get a great deal of data to a customer's home.'[9]

What we were seeing was a classic case of the incumbent carriers not wanting anyone else to play in their sandpit until they had worked out how to win the game. While ISPs and customers kept pushing for faster Internet connections at lower cost without the data cap, they were typically told there was already more than enough bandwidth available for Web browsing. "As long as it stays that way Web browsing is all we'll get. No one's going to develop interesting, new and innovative content when they can't push it out to the customers or let the customers interact with it at a reasonable speed," said Russell.

SPECTRAL NIGHTMARE

In 2003 Cabinet finally reserved spectrum for digital TV but there was still "technical and commercial policy work" to be done to move things forward. The same year Telecom signed a five-year exclusive deal to bundle Sky TV's existing content under a single billing arrangement for its customers with the ability to repackage the programming for its own DSL-based services, if it ever headed down that track. Sky remained king of digital, and the major content provider, hosting TV1, TV2, TV3, TV4, and Prime on its satellite-based digital service. The only competing offering was from TelstraClear, which had 38,000 customers in 2004 and was in the midst of shifting its cable network in Wellington and Christchurch to digital in preparation for launching 25 new channels. It was also locked into an exclusive content agreement with Sky. which viewed the partnership with Telecom and TelstraClear as simply another way to get its content to market.

Sky had about 550,000 customers, the majority on digital, which offered close to 90 services including 56 TV channels embracing movies, news, sport, free-to-air, music, games, gambling, weather, and pay-per-view. The eight pay-per-view movies at $7 a shot – were served up from an nCube server at TelstraClear's data centre in Wellington. Meanwhile Sky was upgrading its internal technology to move up to the next level of service delivery and in the early stages of assessing a next generation set-top box, which would include a hard disk for recording movies. Sky's precious transponder space, however, was full and more capacity wouldn't be available until at least 2005 when Optus swapped its existing satellite with a new generation bird.

There was no such thing as VoD in 2004. The closest we had were hotel systems provided by Maginet and Movielink, which offered a selection of movies soon after their big screen release. Sky TV delivered eight pay-per-view channels and TelstraClear provided four channels in Christchurch and Wellington soon after video store release. While the broadcasters were sorting out their identity crisis, telecommunications carriers and Internet service providers were trying to reinvent themselves as entertainment and content providers. This meant upgrading billing systems to cope with converged content and optimising networks to deliver videos, movies, and interactivity. This was forcing carriers and broadcasters to review their traditional business models, their partnerships, and their role in the converging world of digital communications.

The first signs of consumer readiness for the wider digital experience began to emerge in 2003 through the widespread take-up of LCD and plasma flat-screen TVs, which could handle PC and Web content with clarity. Then there was the plethora of hybrid devices in the home electronics stores designed to interface with the TV including games consoles with hard disks that played DVDs, PVRs with over 100Gb of capacity and wi-fi equipment that enabled music, games, and movies to be shared around the house.

Richer media content was appearing on TVNZ's web sites, where you could watch the night's news and key sporting and other clips. Numerous overseas sites allowed you to preview movies and, with its Windows Media Server, Microsoft was delivering a kind of on-demand service through Xtra's broadband Web channel where short movies, music video clips, rugby, and news footage were available for those who could afford it. There were two Windows Media Servers in the background delivering content optimised for Media Player 9 over high-speed DSL connections.

In 2004 Jay Templeton, Microsoft's product marketing manager for its Windows Client division, had built up his own version of a Microsoft Media Centre PC in his home, using pre-release software. It sat alongside his TV with a 256Gb hard drive and allowed him to play DVDs and stored content, watch Xtra's broadband clips and surf the Internet. His entertainment hub was a glimpse of the future, integrating with his sound system through a Bluetooth-connected wireless keyboard that gave him full control over the viewing experience. The system was ready for VoD if the service was made available. The biggest impediment was the formatting to watch local TV optimally on a CRT TV and the lack of 'true flat rate real broadband' to make on-line content economical.[10]

The Internet was raising expectations for on-demand access and increasing the level of frustration about our slow and data-capped broadband services. The idea of setting aside three months of Thursday nights to watch the latest series of 24, interrupted by the highest ratio of ad breaks in the world, was turning entertainment into irritainment. The video stores were fighting back, offering box sets of TV series that were only a season behind the air date and in some cases pre-empting the on-air plans of some channels. Sky TV was hedging its bets with 'no-late fees' DVD hire.

A pivotal convergence point with the television was the official release in October 2005 of Microsoft XP Media Centre which enabled high-powered PCs to double as entertainment servers. Media Centre presented a challenge to many devices now competing for customer attention. Through a 30-minute buffer you could rewind to the beginning of a programme while it was still recording or fast-forward through the ads. However, the electronic programming guide (EPG) wasn't as useful as it could be, as local broadcasters denied Microsoft access to scheduling. The application would be rolled into Microsoft's high-end Vista operating system.

ARTIFICIAL CEILING

The main obstacle for competitors who were looking to use Internet access to deliver rich media services for things like Microsoft's Media Centre was the artificial ceiling placed on broadband access speeds. Improvements in video compression would continue to make it easier to run fatter services down narrower pipes but dial-up would never cut it in this brave new world and neither would the 128–256kbit/sec entry level that had erroneously been called broadband in New Zealand's recent past. Microsoft, the de facto standards maker, had begun to address that with its Windows Media 9 player, which was capable of delivering compressed TV at 1. 5Mbit/sec, although most experts suggested a minimum access speed for acceptable Internet-based video would still be 4-5Mbit/sec.

Seeby Woodhouse, director of Orcom Internet, said all ISPs were interested in triple play but without high-speed broadband it was a long way off. Orcon would bide its time, gradually expanding its capabilities into voice services and upgrading its internal capacity to 10Gb ready for delivering QoS that would sustain video. "We're going through an evolution. All phone companies are becoming Internet companies, all Internet companies are becoming phone companies and in a couple of years we'll all be TV companies as well. Companies that do triple play with a single billing relationship and bundled services will have an advantage long-term. I can't see that not happening."

The government's Digital Strategy aimed for 5Mbit/s to most residential homes by 2007 and 50Mbit/sec by 2010. That seemed a daunting task when 'broadband' penetration – 256kbit/sec or

greater – was just hovering around ten percent in 2005 with data caps deterring the download of any more than a couple of TV programmes or movies each month if you were lucky.

Ian Quinn, lead systems engineer with Juniper Networks, suggested the way forward might be in incremental steps with different classes of service. Data caps would certainly stifle the development of local content unless a new model was introduced; for example subscription fees for gaming or video. "When that happens, and access to bandwidth increases, video will come in as another service." Juniper was already providing a way for ISPs to charge separately for content through its ERX edge routers, used by both Telecom and TelstraClear, and its intelligent SDX software layer for services deployment. Working in with billing software the ISP could easily identify traffic from a subscriber and charge differently for games, local video or streaming radio content.

If you can't join them beat them was the philosophy of Cisco, literally on the outer as far as delivering IPTV or triple play services in New Zealand. A key player in enterprise computing, Cisco was happy to operate on the edge or last mile. It had acquired Linksys in 2003 and now had a distribution deal with Dick Smith to resell its ADSL2+ complaint broadband and wireless routers for the home market. It also acquired large Denmark-based Kiss, which made set-top boxes and DVD recorders. While removing data caps and improving last mile bandwidth might go some of the way to opening up the market to competitive services, Aaron Scott, Cisco's senior consulting engineer, said the key impediment would be ownership of content. "Even if you have all the bandwidth in the world the majority of content here would still be licensed to Sky TV."[11]

TRANSITIONING TO TRIPLE-PLAY

"A trial of ADSL technology, which involves the transmission of high-speed data services over copper wire, is underway in suburban Wellington. We are also studying the future role of fibre to the curb. Overseas experience is indicating that the cost of deploying these technologies is likely to be lower than hybrid fibre/coax cable; in particular, fibre to the curb holds out the promise of significant reductions in maintenance costs in the longer term … it has become apparent that fast data is likely to show stronger growth in the immediate future than video, which is consistent with our projections at the time the HFC roll-out was planned. In view of this, FirstMedia is to be restructured, with a focus on servicing existing customers." Telecom chief executive Rod Deane, in Telecom's First Quarter shareholder report, September 1997.

Telecom had been seriously ramping up the capabilities of its network to cope with television quality, signal stretching fibre as far as it would go, and boosting the capacity of its copper-enhancing technology to deliver faster speeds into homes.

From late 2004 it was experimenting with a range of technologies including Microsoft's IPTV, designed to turn phone and Internet companies into distributors of content. Cable TV operators had given carriers a bit of a hiding in the past by delivering phone and data services alongside TV and pay- per-view fare. IPTV was a way for the telcos to get their own back and in many cases was viewed as the successor to cable. Unlike Internet-based offerings, IPTV runs in a managed end-to-end environment over telco networks, driving video-on-demand, interactivity, and on-line programming into a new era.

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Telecom had paddled in the content pool before. In 1995 it promised its first media fibre-coaxial cable network would deliver movies and fast Internet to 300,000 New Zealand homes. After passing 65,000 homes in Auckland and Wellington at a cost of around $200 million, it was abandoned and much of the cable pulled from the ground. Telecom had discovered DSL, claiming this was the medium over which it would now deliver movies and TV. After initial trials, this was downgraded to Internet only.

Then there was the three-month JetVideo trial to about 100 homes in Auckland, Wellington, Christchurch, and Taranaki, which ended in 2003. Participants watched a range of movies and music videos provided by Intertainer Asia. The service, delivered to PCs over full-speed JetStream connections, was 'to gauge user reaction.' Telecom said it had learned people didn't want to watch TV on a PC but proved it had the technology and bandwidth to deliver the content though that equipment was still too expensive.

Ralph Brayham, in charge of the project at the time, had been playing with a high-speed JetStream connection and a set-top box in an attempt to learn what Microsoft, TiVo, and DirectTV were doing overseas. "It's fantastic but it's not ready for prime time. The number of users is still relatively small and it's too expensive for most Kiwi households." So what would change that? Mass production of highly capable PCs at extremely low prices. You still need a 200Gb hard drive, high-end video and TV capture cards, lots of RAM, a remote control, and a copy of Microsoft Media Centre or something similar plus a digital TV or plasma projector. "It still requires a big home entertainment swap-out. You wouldn't be using a $1000 PC; you still need the Porsche or Mercedes Benz of the PC industry and you can't use your 15-year old Sony 21-nch TV."

A year later Brayham remained enthusiastic about the next step. "The ability to plan your Internet, TV and messaging experiences could see a profound change in the way people think about entertainment. It will further extend the Telecom brand another leap step into becoming a content and entertainment company." The cost of accessing content was a real issue for Telecom. "I'd like you to give me $20 a month to get some basic movies and $30-$40 to get an Internet connection with variable pricing across the different types of services you want. I'd like to see billing not on the basis of how much traffic you use but how much value this is to you." Telecom was investing $360 million in optimising its network for new generation services and building a multi-access portal capable of delivering a suite of services across any of its networks including interactive television and VoD.

IPTV TEASER

In 2005 Microsoft released the latest version of its IPTV platform. Using the Microsoft TV family of standards-based software and related developer tools, network operators could create new services such as video-on-demand, on-demand storefronts, interactive programme guides, managed content services, and enhanced programming for a mass market roll-out. Through set-top boxes or specialised modems a rich range of content could be received alongside email and instant messaging. The consumer-end software combined instant channel change (ICC), multiple picture-in-picture (PIP) screens, and a comprehensive EPG.

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In his February 2005 survey, TVSpy.com's Stephen Warley quoted figures of half a billion broadband subscribers worldwide by 2010 and 27 million IPTV subscribers by 2008. He believed IPTV would be the primary driver behind the 24 percent annual growth in worldwide on-line entertainment predicted in 2006. The on-line entertainment category overall was expected to increase from US$12.3 billion in 2004 to US$36 billion in 2009. Meanwhile Hervé Uteza, an analyst with US-based Diffusion Group, estimated that worldwide 15.3 million homes would subscribe to IPTV services by 2008. It wasn't a market that would be limited to Microsoft but being first off the rank it certainly had a chance to quickly dominate. Other Internet-based TV applications were in development or market testing stages.

Meanwhile the consumer electronics industry was preparing to take the home entertainment revolution a step further by incorporating IPTV on chip sets that could be embedded in devices ranging from games consoles and PCs to DVDs and set-top boxes – in fact anything that could connect to a TV set. Michael O'Hara, general manager of Microsoft's US-based service provider business, said the whole world was moving to services over IP. And while voice energised the market, eventually cable companies, telcos, and just about everybody would offer some kind of triple play service. Then everyone would probably use the 3G IMS (Internet Multimedia Subsystem) to move into a wireline/wireless integration phase, which added a fourth 'leg' to the stool. "Content will not only be delivered to your home, but to your mobile wireless device."[12]

Telecom claimed to be a serious contender for IPTV and TelstraClear and state-owned transmission company BCL were taking a long hard look. At the time TelstraClear was the only competitor able to bundle video, data (10Mbit/sec), and voice through its digital pay TV network in Wellington and Christchurch. Core content was from Sky TV plus its own pay-per-view movies. It had a nationwide fibre backbone and fibre loops around the country but still depended on Telecom to get to the last mile.

Telecom was engaged in small trials of Microsoft's IPTV platform to test its ability to deliver video to the TV across its copper DSL and fibre optic network. It conducted in-house tests with at least 20 people in conjunction with Sky and others, and developed a hybrid PVR to manage and deliver a range of video-based services. The first commercial customers of IPTV were likely to be in the new suburb of Flatbush on the outskirts of Manukau City, where smart houses, wired with gigabit connections were being built.

Manukau was so confident of the digital future it adopted a policy that all new housing developments must be wired for broadband. More than 500 customers in the Flatbush subdivision and the nearby Highbrook business park would be early triallists of Telecom's NGN. Telecom's $10 million investment in 'fibre to the premises' would help determine how effectively it might progress from its 'fibre to the curb' stance for a direct-to-the-home model.

Meanwhile Alcatel had given Telecom's core network a $1.4 billion make over, so it could deliver full broadcast or on-demand video. Its Multi- Service Core (MSC), 5020 Softswitch, and 8690 Open Services Platform were capable of supporting huge capacity and would open the way for guaranteed quality of service when bundling voice, data, and video. The

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robust new network was expected to completely replace the existing PSTN by 2012, with the first customers migrating during 2007. And a souped-up version of JetStream, which would help facilitate true broadcast quality services, was on its way. Alcatel, Microsoft's agent for IPTV, wanted to ensure the latest ADSL2+ chip sets worked seamlessly with the Microsoft TV framework. It would boost line capacity with ADSL2+ MiniDSLAM multiplexers every 1km to deliver about 15Mbit/sec speeds over copper at selected locations. Once the case was proven all new DSL cards installed on Telecom's network from the end of 2006 would be ADSL2+ compatible.[13]

Geoff Heydon, Alcatel's Australian-based director of innovation and marketing development, said in 2005 that IP voice and high-speed Internet were not terribly complex but delivering video required a complete transformation. "The user never needs to know how much bandwidth is being used, just that the service is always going to be like TV or better." It wasn't impossible to deliver 50Mbit/sec to the home by 2010, and in fact, suggested Hayden, New Zealand would only confirm itself as a laggard if it didn't achieve that lofty goal. He said the maturity of IPTV would force the issue, even pushing home connections out to 1Gb by 2020.[14]

Telecom had stated clearly in its 2006 annual report that IPTV would be rolled out late in 2007: "Over the next 18 months we will begin to introduce a range of new, exciting communications and entertainment services including VoIP, video calling, converged fixed/mobile offerings, and Video-on-demand – all delivered over our Next Generation Network (NGN). We are only at the beginning of our roadmap … and recently formed a new unit to bring our video proposition to market."

While trials of Microsoft IPTV in Flatbush were considered a success, the rich broadcast TV system was switched off once Telecom and its technology partner Alcatel understood what they were facing. The Flatbush project was completed in three phases. In August 2007 the whole suburb was being upgraded to gigabit capacity with fibre going all the way to the home, making it a highly sought-after location for those wanting a connected lifestyle. Similar plans were unfolding at selected new suburbs around the country.

TOO MUCH ON OUR PLATE

IPTV worked okay in the trials although there was an underlying problem with a wider roll-out: the need for a consistent footprint to achieve reasonable quality for broadcast quality or high-response VoD. "The variability across a given suburb with different lengths of copper between the house and the local electronics might mean different performance," said Greg Patchell, Telecom's group technology officer. The problem was considerable across Auckland and Christchurch, whereas in a new subdivision a uniform length of cable from the cabinet in the street to 100 houses could easily deliver IPTV.

Telecom was having a change of heart. Plans for IPTV were put on hold from July 2007 while it shifted focus to more pressing issues including regulatory demands of unbundling and requirements to separate out wholesale, network and retail divisions. Telecom Wholesale head Matt Crockett didn't believe the broadband network would be able to support downloads of TV programmes to set-top boxes until late in 2009, largely because of regulatory

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pressures and the high cost of rolling fibre closer to the home. "Between deploying what is the world's first broadband wholesale product of its kind, local loop unbundling and operational separation, it is just impossible for the industry to do more," he said.[15]

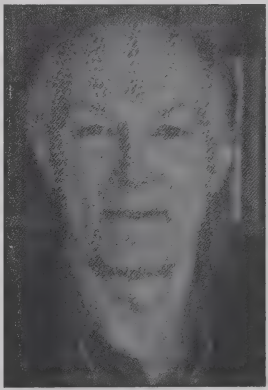
If the network wasn't ready for IPTV then it certainly wasn't ready for the imminent mainstream move to high-definition TV (HDTV), which changed the whole dynamic again. "To deliver HDTV to a digital set plus two normal TVs and your usual phone and Internet access, you need 12Mbit/sec which is beyond the capability of existing ADSL services. It's within the range of DSL2+ presuming there is uniformity of line length," said Telecom's Patchell.

Telecom's admission it wouldn't deliver IPTV before end of 2009 gave its competitors a breather. The traditional free-to-air channels, which had just gone digital, and Sky TV were getting the signal they still had time to get it right before Telecom encroached on their territory.

There was now more incentive than ever to record pre-selected TV programmes and skip the ads, a task made easier with new DVD recorders and set-top boxes. Sites around the world offered movies for download but there were still legal and logistical issues to work through before there was a local offering. Broadcasters remained defiantly loyal to their formats and over protective of their advertising clients but their traditional market, unchallenged since the 1960s, was on fast track for erosion. True convergence with broadcasters and ISPs partnering up for rich multimedia services to the home surely couldn't be too far away?

The May 2005 'Public Broadcasting in the Digital Age' report continued to echo around the industry, suggesting the only way around the 'pervasive air of paralysis' was government incentives and 'the stick of regulation.' Paul Norris and Brian Pauling of the New Zealand Broadcasting School and Christchurch Polytech Institute of Technology warned that without government leadership and public funding, free-to-air television was in trouble. With broadcasters likely to be competing directly with telecommunications companies in the newly converged space, they believed it was time to follow the United Kingdom and Australia with a regulator responsible for both.

The update to their 2001 report commissioned by New Zealand on Air said TVNZ in particular must maintain significant impact to fulfil its role as a public broadcaster. Stronger leadership was necessary for the transition to digital and to ensure programming was accessible to audiences anywhere, anytime, and anyhow, regardless of device or delivery platform. The most striking point made by the report was the failure of broadband, which it saw as the cornerstone of an effective digital communications environment. "The evidence is well documented, as is the pattern of incremental creep, that competition only occurs when the government threatens action or regulation. Competition is essential if new services are to emerge and flourish." Norris and Pauling said the government's ideal of establishing nationwide 50Mbit/sec broadband access by 2010 was a long way from current reality and might require further intervention.[16]



Paul Norris, broadcasting and media commentator.

Free-to-air broadcasters had been digitising their internal systems for five years but had remained in the dark for close on a decade, battling with bureaucrats over how much spectrum they could have and how much it would cost them. While keen to make themselves available on as many outlets as possible they were aware their own delivery platforms were at risk from new technology. They were starting to look like glorified content providers for Sky or possibly even Telecom. Sky had shown only token interest in creating local shows over 15 years, preferring to operate as a digital distribution channel for other parties. As the dominant player in the digital and pay TV market it had already herded all its potential competitors under its wing.

Sky Network merged with Independent Newspapers in 2005, becoming the country's biggest media company. It had 619,000 subscribers as at April 2005 – about 87 percent of them on digital. Its My Sky PVR was launched in December, enabling the recording of two channels at once, and through its buffering technology subscribers could pause and rewind 'live TV.' It stored about 60 hours of programming on a 160Gb hard drive. The EPG made it simpler to determine what to watch and when. Sky commissioned five new transponders on the Optus D satellite from mid-2006, giving it room to double its offerings to around 160 channels if it wished.

The only competing offering was from TelstraClear, which had finally upgraded its cable TV system to digital status in 2005 for delivery to 40,000 customers in Wellington and Christchurch. With a cable modem and set-top box, and obligatory phone line with TelstraClear, subscribers on a high-end plan could access 10Mbit/sec broadband plus free-to-air TV channels, traditional Sky packages and 27 pay-for-view movie channels. VoD was on the way. The ability to bundle multiple services or triple play' (data, voice, and video) was a big incentive to carriers to add value to their business model and it was happening worldwide. Telecom was looking seriously at how to play in that game as was everyone else, including the ISPs who had so far been disappointed in their attempts to add video to the mix.[17]

NO SPECTRUM SHORTAGE

The availability of spectrum for the free-to-air channels had been cause for concern for some time but the government's own report showed there was a large amount of unused UHF spectrum. "The government has struggled to engage on the issue of spectrum and when it has engaged it has come up with conclusions that are different from the industry," said Bruce Wallace[18], executive director of the New Zealand Television Broadcasters Council (NZTBC). 'Proper' digital terrestrial TV needed to offer new content and technical features.

"It is illogical and confusing if we have to buy that extra frequency. As well investing in internal equipment for broadcasting to transmitters there's the cost of distributing analogue and digital signals concurrently with the same advertising revenue stream." While Wallace insisted the transition was in the public interest there was little incentive for broadcasters to dig into their pockets. "We need a sophisticated digital platform. It only requires the government to allocate free spectrum, which is nothing more than has happened in other countries."

CanWest's director of operations, John Allen, had looked at all the options and even considered pay TV or Webcasting but remained convinced there was still a strong place for digital free-to-air broadcast television. The lack of any concession from the government on frequencies was a growing concern as the months ticked by. While interactivity may bring in additional revenue it remained a niche activity. "Extra transponder space and massive back office and transmission infrastructure are required if people are downloading different things at different times. We're keeping it in the back of our mind." William Earl, TVNZ's special advisor on policy and planning, said the level of co-operation required to make digital television happen was quite unprecedented. "The sooner we hear the full

story the better. A high degree of agreement on the operating platform, set-top boxes, satellite and transmission facilities is essential."

The prospect of crisper, clearer, more colourful images, better sound, and compression that could deliver ten times as many channels over similar spectrum was an attractive proposition for the free-to-air broadcasters. Even more enticing was the fact that the old analogue networks and transmitters were nearing their use-by date – no one was making that equipment any more – and at an as-yet-unknown date the government was planning to flick the analogue off-switch. Still no one would confirm how much spectrum they would be allocated or whether they would have to pay for additional frequencies. State-owned BCL was also taking its time announcing its technology and business case.

Meanwhile there was work to do, to get widescreen infrastructure in place so the 4 x 3 aspect ratio didn't make newsreaders and pop idols look bloated. And another challenge was the next quality leap of HDTV. Broadcasters looking to add mobile to their offerings also needed to take into account the new terrestrial DVB-H format, to transmit to mobile phones, in-car TVs and public transport. Interactivity might add value but would also require huge investment. However digital evolved it would need to be open and flexible enough to embrace changes and enhancements that hadn't even been considered yet.

By the end of 2005 the NZTBC, comprising free-to-air players CanWest TV Works, TVNZ, Sky, Prime, and the TAB, were nearing a consensus to deliver terrestrially to most cities and towns and by satellite to outlying and difficult-to-reach areas. To avoid the need for a separate dish they'd have to acquire space on the Optus satellite used by Sky. TVNZ had been running terrestrial digital TV trials in 2005, broadcasting to 150 staff members in different parts of Auckland, using BCL's Waiatarua site in the Waitakere Ranges. The outcome was being shared with Prime and CanWest.

The broadcasters couldn't invest in transmission systems unless they had the spectrum and an affordable deal with BCL to deliver digital terrestrial television (DTT). BCL was no stranger to digital broadcasting, having been involved in trials for over a decade. It had undertaken a thorough analysis of the technical and deployment options in line with the DTT technical standards adopted in 2001 but wouldn't move unless it had a business arrangement with the broadcasters. It had already invested $40 million upgrading its microwave backbone network but needed some kind of commitment before installing new digital terrestrial microwave transmission equipment across many of its 400 nationwide locations. It was still catch 22.[19]

And then there was the issue of content. If free-to-air broadcasters had to invest in new digital channels would that eat into their creative budgets? Sky TV held all the aces as the de facto digital distributor even for public television. And what about all that archived content the public tax dollar had enabled? The big hoarder of sought-after local content was government-owned TVNZ. What were its plans for digitising and delivering its decades of archived programming? And when it did deliver on its charter imperative to move to digital, would it still be free-to-air? Would it encourage a new generation of documentary and film makers to get involved? Would it work in with existing metropolitan niche TV channels or use the extra channels digital had enabled to wipe them off the planet?

ANALOGUE OFF-SWITCH

Without significant local and interactive value being added to the experience there was little incentive for New Zealanders to move up to digital unless they were in remote areas with bad reception or were blackmailed by an analogue switch-off date. In their submission to the Ministry of Culture and Heritage, The Creen Production and Development Association (SPADA) and the New Zealand Screen Council both recommended the switch be flicked in 2012. The Screen Council said New

Zealand needed to keep pace with its primary markets, in particular Australia, which had an analogue switch-off scheduled for 2009, the United Kingdom, which would begin regional closure from 2008, Japan, 2009 and the United States 2009.

Regardless, consumer uptake might still fall below the necessary threshold targets. SPADA, which represents independent producers and production companies, believed the key to consumer conversion would be high-quality programming and diversity of content. This depended on the health and growth of the independent screen production sector. SPADA continued to express concern over the lack of regulation in the broadcasting environment, notably, constraints on foreign ownership of media companies and on cross-media ownership; particularly 'in a highly competitive international market dominated by vertically-integrated multinationals.'

It said New Zealand needed to facilitate the delivery of high-quality, locally made programmes and ensure its content producers received their share of value generated by new media, rather than devaluing the worth of that new media by ghettoising the programming that goes on it. "It is only during the transition period that a distinction between delivery platforms exists. When the switch-off date arrives, New Zealanders will only be basing their choice on content," said SPADA chief executive Penelope Borland.[20]

While the debate about digital broadcast television was nearing some conclusions, telecommunications carriers, ISPs, broadcasters, PC manufacturers, and home electronics companies were still eyeing the Internet as the dominant alternative. There was huge interest in multimedia offerings on-line, including the growth of social networking sites, and with the music download revolution now legitimised, the focus was on accessing TV programming and movies. There was also increasing pressure to go big, flat, and wide, with buyers having to ask a range of questions to ensure they were future-proofed for the next five years. Do you want LCD or Plasma? Does it have the right inputs to plug in the DVD recorder, VCR, My Sky, sound system, and PC, and more importantly, does it have high definition multimedia interface (HDMI) the new single cable approach for digital including high definition TV?[21]

Essential components in moving the digital home concept forward were new hardware and software tools to create, download, record, play, and manage digital content. These ranged from hard disk and DVD recorders and players to highly configured PCs and Macs, games consoles that doubled as content management systems and enhancements to Microsoft's operating system, media player, Web browser,[22] and media centre software – capable of managing the entire digital home concept. Increasingly people were hooking their computer systems up to their TV and home theatre systems to record direct to hard drives, play music, store photos, and stream media throughout their home.

THE LEAPFROG EFFECT

Acer's chairman J.T. Wang believed that after several false starts the digital home would take off from 2007, as new devices and software hit the market and users began to replace their home entertainment equipment with digital devices. The growth in media player products and increasing willingness of the entertainment industry to sell movies and music over the Internet was an important factor.

Intel's government and telecommunication business development manager Sean Casey was concerned about the impact of all this fancy new technology on New Zealand's economic development. He was part of a worldwide team lobbying governments to lift their game 'beyond the processor' in the global digital playing field and believed local loop unbundling was an ideal opportunity for New Zealand to catch up. It was critical to be digitally connected and broadband was essential if we were to maintain a competitive advantage. Our biggest threat he suggested was

coming from emerging markets, including third world nations, which were going straight to leading-edge technology.

Rather than struggling through legacy systems they were part of 'the leapfrog effect,' jumping straight from 'greenfields' into high-end PCs and broadband. "They recognise the importance broadband delivers in educating citizens and the place technology can play in improving their economic outlook and are embracing this with open arms." Casey said a raft of technologies were waiting in the wings, including new services such as VoD and IPTV, but this would only happen in countries where there was affordable broadband. "Soon you'll be able to watch what you want, when you want and where you want but broadband needs to become economically viable or you prevent that becoming reality."[23]

In February 2007 Broadcasting Minister Steve Maharey reiterated the government's support for the free-to-air broadcasting consortium which had branded itself Freeview, while warning the country's rite of passage into the digital age was tightly aligned with our future economic transformation.

> *"We have supported the establishment of the Freeview platform and provided it with funding of up to $5 million per annum for five years through the initial stage of transition to analogue switch-off. Freeview is a practical solution to the question of how to take the public broadcasting model forward into the digital age. The beauty of Freeview is that it is a clearly visible bloc, a strong contender in the world of digital providers, and one that gives a digital presence to the various strands of public broadcasting: the TVNZ Charter, Maori Television and Radio New Zealand as well as NZ On Air and Te Mângai Pâho. An extremely significant aspect of Freeview is the two new non-commercial channels to be established by TVNZ. For the first time, New Zealand will have commercial-free, free-to-air public television."*

Maharey said independent research had revealed New Zealand stood to gain an estimated $230 million if it made a full transition to digital television with analogue switch-off by 2015. If this didn't happen, the net cost to the country could be as high as $156 million. "The transition to digital is not without challenges for public service broadcasting. Digital technology and more efficient use of spectrum open the door to an increasing number of broadcasting competitors. That proliferation of channels is already happening in the pay TV sector in New Zealand." He said increased competition and competing consumer choices through the development of new platforms including satellite, cable, Internet protocol, and mobile telephony consumers would challenge traditional advertising revenue models and increase fragmentation of audiences.

Former broadcasting minister Steve Maharey.

Government support would help ensure that digital technology enhanced public service broadcasting, rather than overwhelming it. The proposed new channels would allow more local content, extra screening opportunities, and time-shifted viewing so special interest programmes could be more accessible. "They will be a testing ground for innovative content, provide space for in-depth material beyond the constraints of commercial programme lengths and greatly enhance TVNZ's ability to meet its public broadcasting objectives as reflected in its Charter." The new channels would get $79 million through to 2012 to help achieve content with a strong local emphasis and cultural relevance. "We expect TVNZ to reclaim its role as champion of New Zealand content and culture…and demonstrate to New Zealanders that it is delivering on 'charter' objectives."[24]

Maharey said broadcasting was a powerful and pervasive medium which had a huge influence on how we perceived ourselves, our world, the information we have access to, and how we respond to important issues:

"The role of the public broadcaster in New Zealand is to harness that influence to support social and cultural objectives and to provide an inclusive broadcasting service to all New Zealanders. Public broadcasting has a vital role in the development and expression of our national identity. It is a forum for the exchange of ideas, supporting us as well-informed and involved citizens. It tells us New Zealand stories that reflect and enhance our own culture. It delivers quality and breadth of content to meet the multiple needs of our diverse society … so [we are] treated as citizens rather than consumers."[25]

CHANNELLING CHAOS

Broadcasters were looking sideways at telecommunications carriers, and carriers and ISPs were looking at every option to add value to their platforms. Global trends clearly indicated TV and video were the next wave. Sky TV and Vodafone had launched their mobile platform at the end of January, with eight channels including cartoons, news, sport, and MTV reality shows delivered to Vodafone's 3G mobile customers. In February they announced more than 10,000 New Zealanders a day were logging on to their mobiles to watch up to 20,000 video streams. Sky TV saw the partnership as another way to offer content to customers anytime, anywhere, to watch what they want, when they want, said Sky TV CEO John Fellet. Customers could watch all eight channels for $2.50 a week.[26]

Then in September Vodafone added an adult TV channel and about to offer its mobile customers access to YouTube videos. A new music channel and full-length movies were also planned. Customers would pay 50 cents to view the X-rated channel, with Vodafone claiming it would donate the income, less costs, to charity. Meanwhile state-owned Kordia (formerly BCL) was trialling a digital broadcasting technology called DVB-H which would enable mobile phones to act as fully functioning mini-TV sets to pick up free-to-air TV channels. For Auckland coverage it was thought it might cost as little as $10 million to add DVB-H capability to Kordia's digital terrestrial television network, and it was looking for the right business case to go ahead.[27]

In March TVNZ launched its Web-based TVNZ Ondemand service, a mix of free streamed clips and paid-for downloadable shows users could purchase using PlayPoints – the equivalent of $2 for a 22-minute programme – as currency. The site launched with 300 videos from 100 shows including news and current affairs. Its offerings included classic coverage from the Wahine disaster and the first 1966 All Blacks-British Isles test in Dunedin. This was part of TVNZ's new five-year strategic plan to be on 'every screen' and its popularity was expected to grow as broadband penetration became mainstream. A minimum broadband speed of 500–600kbit/sec was required for a good user experience with a speed of 5–7Mbit/sec considered ideal.[28] TV3 had launched a service earlier in the year but it was mainly focused on downloading newsclips. TVNZ said it hoped to make $40 million a year from downloads by 2010.

Although flat-screen TVs had been a huge selling consumer item for several years and made up around 95 percent of all new sales, the fact was a high percentage of New Zealanders were still happy with their old, square, 4:3 ratio CRT sets. The freebie channels available on Sky for a couple of years had begun converting their technology over to the new aspect ratio. On old sets the outer edges were being trimmed out or black bars top and bottom left a narrow image in the centre. Some programming filled the screen, but increasingly new episodes of *The Simpsons* and other

modern programming shrunk back to leave black borders. Many of the old-school TV viewers were not happy.

TV3's largely unannounced switch to 16:9 ratio widescreen broadcasting in April was the first warning that things were changing. TVNZ followed suit in September, and within a decade widescreen would be mainstream. "The problem when you migrate to widescreen is that you haven't instantly got all of your programme material in widescreen format so you have to convert it," said Doug Stevens, TVNZ's resources manager, who was overseeing the conversion. "We've got this transition period of at least a year, depending on how many thousands of hours of content we've got in 4:3."[29] Square set viewers should have been alerted to the problem, if that's what it was, much earlier as the majority of DVDs were released in, or had been converted to, widescreen format. To fill the screen required using the zoom button, something not available on the TV set.

What was described as 'the most significant event in New Zealand broadcasting since the launch of colour television in 1974' hit the airwaves when Freeview went live on Wednesday 2 May 2007. Backed by a consortium of TVNZ, CanWest MediaWorks, Maori Television, and Radio New Zealand, it claimed its role was "to promote access to the very best in high resolution, digital quality television and radio services with no monthly fees and no contracts."

WHICH BOX DOES WHAT?

Consumers needed to invest anywhere between $160 to $650 depending on whether they purchased an official Freeview set-top box or needed to have a satellite dish installed.

The Freeview consortium approved only two set-top box makers, Zinwell and Hills Signalmaster, which sold through home electronics chains for around $300, which was $100 more than originally indicated. The boxes would deliver digital TV and radio reception, an EPG, favourite channel settings, an output for audio streams delivered in Dolby Digital surround sound and widescreen support. Boxes incorporating hard disk-based digital recorders were on the way. Those with an unused Sky TV satellite dish could simply plug their Freeview digital set-top box into the existing connection to get the satellite feed, as Freeview was delivered from the same Optus D1 satellite used by Sky.

Meanwhile parallel importers or local creators of set-top boxes were hawking their Freeview-compatible boxes. One company had taken delivery of 4000 boxes from China for as little as $160. A more advanced version with a 160Gb hard drive sold for $595. Peter Escher, managing director of Satlink, went head to head with Freeview offering viewers a set-top box and new module for their satellite dish at $180, so they could pick up the Freeview channels and more than 20 foreign language and religious channels broadcast unencrypted over the Pacific. "Freeview has slightly lost the plot as it has got nothing going on air like the BBC, just local content. The response from a lot of folk is disinterest, as they can already watch TV One, Two, Three and C4," said Escher. Computer enthusiasts were also busy building their own digital TV-capable media centres, using PC and satellite tuner cards. While they couldn't pick up the official Freeview programming guide, the electronic TV listings were available unofficially for download on the Internet.[30]

NZ On Air's Local Content Report showed the highest ever levels of New Zealand content on television in 2006, with 10,255 hours of local content on free-to-air television – nearly double that of 1999. There were just 2111 hours of local content on TV when official reporting began in 1988. According to Steve Maharey:

> *"Television provides New Zealanders with access to their own stories more than ever before, with public broadcasters successfully reflecting our culture and national pride. The government funded Maori TV has been included in the local content report for the first time in 2006, and is providing an impressive 75*

percent local content. C4 was also included in the report for the first time. This proves that all of New Zealand's national free-to-air TV channels are boosting local content, providing more choice of quality local programming for New Zealanders." [31]

A government scoping paper released in June, ahead of a review of broadcasting regulations, suggested digital television was leading to convergence of broadcasting, telecommunications, and the Internet and new forms of 'market concentration.'

It was possible Sky TV might be forced to carry the new channels and let customers download Internet TV programmes to its set-top boxes on terms and conditions set by regulators. The Culture and Heritage Ministry's director of digital broadcasting strategy, Jo Tindall, would not rule out forcing Sky to open up its pay TV network to programme-makers on set terms, noting that local cable companies in the United States faced similar 'must carry' obligations, although there might be areas in which industry self-regulation would be the most appropriate avenue.

Tindall said digital TV had "changed the nature of competition" with devices such as electronic programme guides giving broadcasters a new means to control how programming was positioned. She said the government's goals in relation to digital TV related to national identity or cultural identity, economic transformation, the government's ownership interests, and the fundamental principles of public broadcasting. "An issue around cultural identity is obviously predominant when you are looking at a policy response like NZ On Air, or funding for TVNZ's digital services. But an objective around economic transformation may be more dominant when you are looking at issues of infrastructure."

Freeview voluntarily embraced the 'must carry' approach, issuing a code of practice within weeks of its launch giving any TV company or content provider an opportunity to use its free-to-air network on common terms for a $25,000 set-up fee. The ministry planned to publish a discussion paper on digital regulation and Steve Maharey would make recommendations to Cabinet based on that.[32]

TVNZ continued to ramp up its 'every window' strategy, announcing in June that it had entered a partnership with Google to bring TVNZ content to YouTube, where it now had its own TVNZ channel, offering short videos including interview segments and edited highlights from its archives right through to current programming. Viewers could comment on clips, rate them, recommend them to friends, and add them as favourites. The deal, allegedly the first of its kind in Australasia, followed a similar arrangement YouTube had with the BBC.[33]

Then the clamour started. First National Party Broadcasting spokesman Jonathan Coleman had a dig at the government's plans to review the charter, which was up for evaluation anyway. He described the feel-good nature of the charter as a diversion from discussing the real financial problems of TVNZ. He said there was nothing against which to measure the Charter's objectives, and redrafting it was unlikely to make any difference to what the public saw on their television screens.

"Maharey … has saddled TVNZ with a dual remit that is making life hell for anyone working at the state broadcaster, and he would be hard pressed to show any difference the Charter has made to programming. [He] would be far better to concentrate on … coming up with a workable broadcasting policy that will survive the digital challenge."[34]

The next day Coleman slammed the low level of content being offered on Freeview, wanting to know how many converts there were two months down the track. He wondered whether New Zealanders were getting value for the investment in public digital TV:

"The reality is that the minister has never had a strategy for delivering audience numbers to Freeview, and as with the rest of his broadcasting policy, there is a big emphasis on the feel good factor of digital television, but no hard numbers, no targets and no credible plans for achieving them. When $105 million of taxpayers' money has been spent by the minister on digital television, the public deserves to know what that money is delivering for the country. One thing is for sure: if the numbers were good, Mr Maharey would be telling us all about them."[35]

Meanwhile Freeview began gradually adding new members to its stable. State-owned Kordia agreed to subsidise moving community TV station Triangle Television to digital. The Auckland-based company broadcasts a mix of news, entertainment, ethnic, and other community-based programming 24 hours a day and invites viewers to make their own programmes. It had come to an arrangement for nationwide broadcast on the Freeview satellite platform. Founder and chief executive Jim Blackman had previously criticised the government for choosing not to contribute to the costs involved in moving community TV stations to digital, saying these were daunting. Kordia's decision to offer cheap access to Freeview was seen as one way of using the public purse to help meet costs.[36]

RECYCLING CONTENT

In early August Freeview announced its numbers. Sales figures showed more than 21,000 set-top boxes had been purchased in the three months since launch, making the total number of households with free-to-air digital satellite reception close to 41,000. Freeview general manger Steve Browning said the target was 40,000 households, or 100,000 viewers within a year. Since its launch Freeview had announced the addition of TVNZ Sport Extra, TVNZ 6, and a satellite exclusive version of Triangle Television. Everything was on track to reach the target of 12–15 services by the end of 2008.[37]

The first of the new state-owned 'advertising-free' channels, TV6 would feature "between 5-75 percent local content" targeting preschoolers, families, and adult viewers. The programming schedule, however, suggested rather than fresh new content, a high percentage would be reruns, for example, children's puppet show *Fraggle Rock* and old favourite *It's In The Bag*. TVNZ Kidzone for pre-schoolers promised 15 percent of content would be newly commissioned. The family viewing segment undertook 27 percent new local content and adult programming would offer 22 percent new material. In March 2008 TVNZ 7, the second new state channel, would launch, featuring news and current affairs shows.

Unitec School of Communication senior lecturer Peter Thompson said repeating local shows wasn't necessarily a bad thing. "Some of the repeats aren't just there because they don't have anything better to put on … Some of it is going to be there in order to make sure you get the maximum reach across the audience … If it was the same thing over and over again, I'm sure anybody would say 'wait a minute, this isn't really 75 percent local content, it's not new local content.'" He wondered whether the content would be sufficient to attract the audience necessary to propel New Zealand towards analogue switch-off.[38]

In August TelstraClear was completing a $1.3m transmission upgrade on its network, allowing it to expand its channel capacity and optimise picture quality. By November its 70,000 plus InHome TV customers in Wellington, Christchurch, and on the Kapiti Coast where the company had its origins as Kiwi Cable, would have 15 new channels. It would also add additional pay-per-view channels.[39] That would take the number of channels including the free-to-air offerings and those taken directly from Sky TV to more than 90.

The guano started to hit the fan in September with Sky and the free-to-air broadcasters posturing over the way forward, and consumers concerned about how many set-top boxes they might need to get access to all the digital TV offerings. Would viewers be locked in by the next generation box they selected? TVNZ chief executive Rick Ellis announced he had no plans to make TV6 and TV7 available to Sky TV subscribers after its content contract expired in 2011. Sky TV chief executive John Fellet responded in kind, saying he doubted whether his free-to-air channel, Prime, would be available on Freeview's digital terrestrial platform in 2008. However he suggested getting access to TVNZ's new channels shouldn't be a technical problem as more than half of Freeview subscribers were already using non-approved set-top boxes, and he didn't think there would be any legal impediment to viewers tuning them in to the MySky mix.

Rick Friesen, chief operating officer of TV3 and C4 owner MediaWorks, said Freeview needed to compete against Sky as the pay-TV company was "a threat to the mass-market audiences that make free-to-air TV possible . . ." Paul Norris, head of Christchurch Polytechnic's broadcasting school, warned TVNZ's stance in denying Sky access to its new channels could be a 'public relations disaster,' given that taxpayers had contributed a share of the $79 million allocated to fund the new channels. The government he said should want the channels to reach 'as wide an audience as possible.'[40]

AFTER THE FREE RIDE

Norris[41] said New Zealand had been very slow in embracing digital television and the digital television framework. We hadn't necessarily done anything wrong; it was more about the size of the country and its inability to make major investments to broaden our options. In fact coming in late might have its advantages as any bugs should have been ironed out. "We're not rushing into anything. We've had the launch of Freeview by satellite and in 2008 we'll have Freeview by terrestrial and there will be two new channels, which all sounds faintly ludicrous, when you think about who's going to be viewing them and how quickly they might gain an audience. The Freeview take-up is going to be a very slow, long ritual."

The big question, said Norris, was what happens after the six-year government funding runs out for the new state channels. "How will TVNZ fund those non-commercial channels? Will they suddenly become commercial channels? Will TVNZ add more channels in the meantime?" The debate continued as to whether there was sufficient incentive for viewers to switch to Freeview unless they were in a remote location with bad reception. Even then the equivalent cost of a satellite dish and set-top box would most likely cover a couple of year's subscription on Sky, which offered more content. There were also some obvious consumer cautions. Both Sky TV and Freeview expected to begin selling next generation set-top boxes that could connect to the Internet as well as receive programmes broadcast by satellite and terrestrial transmitters in 2008. The new Mpeg 4 hard disk-based boxes could cost $300–$500 per unit. If you had just paid $200–$300 for an existing FreeView box you weren't going to be too happy about that, particularly when you could only flick between existing free-to-air channels and two new high-definition channels, with a high percentage of repurposed content.

Sky was spending $50 million transferring its archives and studio systems from magnetic tape to computer disk in preparation for its next step service. Among the benefits of Internet-connected set-top boxes, said Sky TV chief executive John Fellet, was that subscribers would be able to view any episode of *Friends* when they wanted and besides, TV channels that streamed content at scheduled times might become redundant over time. Sky would begin supplying a 'second-generation' HDTV-based My Sky box with a 320Gb hard disk drive and Internet capability by late 2008.[42]

The new HD boxes, being developed in conjunction with subscription television provider Foxtel in Australia and made by UK-based Pace, would have an Ethernet port for Internet access. In November Sky had more than 700,000 subscribers, of which 26,000 subscribed to MySky and there were nine different versions of boxes in use.[43]

Then there was the issue of digital rights management (DRM) required before any major content provider would allow retransmission of their material in high-definition format. While existing content was already out of the bag and unlikely to be controlled in the near future, downloads from the TVNZ's Ondemand web site already had an internal trigger that rendered clips unplayable after seven days. Freeview's HDTV service from 2008 would only allow programmes to be recorded on designated devices and that content was likely to have a finite life. TVNZ chief Rick Ellis said it was fair to limit the life of a recorded television item, even substantially locally generated TVNZ news programmes, many of which had clips inserted from sources such as the BBC, which had its own terms of distribution.[44]

IPTV ON PAUSE

Paul Norris, a respected media commentator, said the paper he co-authored with Brian Pauling on the future of digital television in 2001, with a revision in 2005, had the broad picture fairly right in isolating the key contenders and aspects of development. This was confirmed at the National Association of Broadcasters convention in the Las Vegas in April 2007, where IPTV and delivery to mobile devices were seen as the two key drivers.

He thought it was a good move that Broadcasting Minister Steve Maharey and ICT Minister David Cunliffe were talking about ways to bring their portfolios closer. "It's inevitable and just another aspect of convergence. Broadcasting, if you think about it as the conveying of signals of information or entertainment from the content provided to a viewer or listener, should now embrace telecommunications. The transmission system will be as much a part of telecommunications as it would be of traditional broadcasting via microwave links or satellite; and as soon as we start talking about IPTV it's obviously the field of the telcos."

In June 2007, Ernie Newman, CEO of TUANZ said:

> *The government has recently announced a move towards the convergence of broadcasting with telecommunications regulation, a lead that other governments including Australia have set some years earlier. This too could offer a timely opportunity to bring broadcasting within the ambit of the same dedicated agency, ensuring that the related issues of high definition video-on-demand and the range of other policy drivers for the future of broadcasting are addressed hand in hand with the telecommunications platform. This seems to me a more rapid and effective way forward than the current proposal where the Ministry of Culture and Heritage, and the Ministry of Economic Development are to work jointly on a review. We can also draw on the experiences, good and bad, of other countries that have implemented agencies specific to ICT such as the IDA in Singapore and NOIE in Australia.*[45]

Norris wasn't surprised Telecom had pulled back from delivering IPTV until 2009. "IPTV really depends on having a good broadband network across most of the country; at least 2-4Mbit/sec. We're nowhere near that; most of us on broadband are still struggling with 200-300kbit/sec." IPTV also depended on having access to good content. "Telecom's not going to make content, so it will need to partner with people who've got content. There's no evidence of them actually having done any deals which would lead to IPTV tomorrow, or even next year to be honest."

James Watts, chief executive of Inspire.net, the Palmerston North Internet service company building its own open access fibre around the city. The company was ranked top ISP by Consumer Magazine *readers for the fourth year in a row in 2007.*

He said IPTV was unlikely to be a killer application that knocked television of its perch or brought in the end of broadcasting. For a start most New Zealand households wouldn't be connected to fibre in the foreseeable future. "Some of us have a vision for the future that is very digital, very connected and very much video but this doesn't happen overnight. We already heard the quote 'television is dead' in the mid-1990s and a similar quotes from MIT, giving evidence to a US select committee saying 'forget TV and TV sets, in three years there won't be any.' So the evangelists and enthusiasts are always well ahead of the game."

Rather than everything morphing onto a single set in the lounge Norris believed the future would be on many screens. "In the long run there will be a series of screens in the house and they will all be fed by computer-like devices which will be able to store things digitally and present you with electronic programme guides so it won't really matter whether you are viewing content over a large flat plasma set that could double as a computer screen." However viewers would demand quality content. "That's where IPTV and many of the download systems fail because they haven't always had access to good content which typically still remains with the broadcasters who are ideally the content specialists. They need to get that content out to prospective viewers on every platform possible. That's why you're finding more material delivered by the television schedule also on web sites and downloadable to iPods and mobile phones."

However, asking what the consumer wants is not that easy, said Norris. "There are no simple answers; we're not really one society. There's no single set of wants that you can prescribe to everybody. The younger generation in their approach to the media are behaving very differently to people have in the past. The habits of my children who are teenagers, or in their early 20s, and the students here at the broadcasting school, are very different. They're all into their social networking sites like MySpace and Bebo and FaceBook. They're using media in a different way but that doesn't mean they don't want to sit back and watch a good TV programme from time to time."

Major broadcasters were escalating their plans to make TV content available for download or streaming over the Internet or on cellphones and mobile devices as the 'third screen.' What was unclear was the business model, the role of advertising, and whether securing payment for on-line rights would be by subscription or advertising attached to free content. "There are a lot of issues to be worked through and it would take a long time before we are truly a digital, or digitally connected nation." So ideally television and the Internet – how will that work? "Well they have to be accessible, ideally from one device. And that's where the hybrid box comes in which can receive say digital TV and access the Web. That would be a big step forward," said Norris.

While Telecom backed off from its plans for IPTV, that didn't mean no one else was preparing to step up. Video remained the third and most attractive portion of the triple play equation for the traditional carriers and ISPs that were growing up to be full service providers. James Watts of Palmerston North–based open fibre provider Inspired Networks was eager for true, unconstrained access to Telecom's network but continued extending his own network. He'd been in Canada in 2006 evaluating a full HDTV platform which could be delivered within an IPTV framework. CallPlus had its sights set on IPTV as a third content component of its wireless-DSL hybrid strategy alongside voice and data.

From early in 2006 Orcon had been making serious investment in the kind of backroom advances that would enable it to manage and bill for IPTV. It had a $30 million five-year plan with Siemens and Juniper and even talked of delivering 50 channels of TV over fast DSL. From June 2007 Orcon certainly had the perfect partner to expand those grand convergence plans when it was acquired by broadcast distribution and infrastructure owner Kordia. Anything was possible and behind the scenes all players, at varying stages of readiness, were watching the starting line nervously as the full details of naked DSL were ironed out to free up competitive, full-speed Internet access on Telecom's network.

CONTENT IS STILL KING

Philip King, Telecom's general manager of video services, believed the extra 18 months of grace before an IPTV launch would give the carrier a chance to streamline its roll-out of light-speed fibre cable closer to the curb with shorter copper loops enabling DSL2+ to perform optimally. "You need guaranteed traffic classes for video and voice and a minimum of 5Mbit/sec to the home to deliver pay TV, or normal TV over IP, plus high speed Internet and a voice over IP connection. You don't want pixelating if someone else in the household jumps onto the Internet at the same time."

There were many non-trivial things to work through in terms of investment in IPTV software and the IT capabilities. The helpdesk, for example, needed to have control and monitoring systems that identified whether the customer problem was with the TV picture, the set-top box, the home wiring, the home gateway, the video pump, or encoding of the video at the head end.

In Telecom's consumer division, King's team was shaping up the proposed IPTV offering with a focus on the customer experience. Anyone else planning to use the Telecom network for IPTV would need to go through a similar planning process within their own organisation and have to strike a deal with Telecom Wholesale for delivery when that wholesale product was made available. Telecom's Flatbush trials were largely based around technology and were highly experimental, having little bearing on the ultimate Telecom IPTV roll-out. In 2006 a further internal trial of IPTV was conducted with Sky and Telecom staff. This time it was more about the user experience, looking at how future service deployment might be driven using a range of video-on-demand and interactive applications.

So what can we expect come 2009 when Telecom finally lets IPTV out of the can? "IPTV is TV quality content, delivered over the carrier's IPNetwork to your TV in a very managed way. This is a TV experience not an Internet experience," said King. While he doesn't like the term 'walled garden' that is in effect what is being proposed: a closed system, although that doesn't necessarily exclude using your keyboard to navigate outside of that to surf the Internet. "People will get to the Internet another way; that's not what people will subscribe for. IPTV's a lean-back, be entertained experience with an on-demand environment, providing you with the content you want, when you want to watch it. Initially it would augment free-to-air or pay TV offerings which would get bundled with it. Over time the world is moving increasingly towards an on-demand lifestyle for content."

Philip King, Telecom's general manager, video services.

As well as having a set-top box where you could save content or programmes from live channels using an EPG, you could have a catalogue of 2000 movies available on-demand, very much like the service on international flights. In fact King believes the airline analogy is a good one. "In the old days with broadcast TV, it was like

having the one screen at the front of each cabin of the plane and they showed you one movie. Then they moved to systems where you had about eight channels on two hour rotates. Now you have a truly on-demand systems where you can pause, fast forward or rewind from a wide range of content."

Telecom could leverage its existing retransmission arrangement with Sky for the new IPTV offering and also work with the free-to-air players. But where will that big database of hundreds of movies on-demand come from? "All the studios are happy to talk to us and are interested in exploring those possibilities. That's a big change over the last ten years. We first started looking at pay TV with First Media in the 1990s when it was hard to get Hollywood's attention," said King. "These days, they're watching TV platforms develop over the world and are increasingly interested in working with telcos. Content is in many ways easier to get but no less expensive; that remains a barrier to entry for anyone getting into this."

Telecom doesn't see itself as a content originator; it's just another conduit taking other people's content and using it in different formats. One of the services consumers have expressed interest in is catch-up TV, where previously screened top-rated shows are available on-demand for the next seven days. A range of different tariffs would be necessary. "You might give catch-up TV free because you want to build an audience for a show or you might bookend it with advertising to sponsor it."

There might be scope for successful Web-based providers like TradeMe to create a TV show, or YouTube might be able to make the transition, but somethings are better suited to the Internet. "The TV remains the TV and the top shows still rate. What's really interesting to me is that the output of the studios is not growing. There are still 20 blockbusters released every month and the key studios in the US only release so many top-rating shows, sitcoms, and drams each season and the volume is not increasing significantly."

The number of content of channels has proliferated greatly in the United Kingdom from ten years ago when there were 90, to 500–600 now. However the number of channels people watch hasn't grown that much. On average people only watch about 7 channels. "What you have is a fragmentation occurring at an alarming rate with more niche channels and content developing but the high-rating TV series remain more important if you want to reach that mass market. And there's a hell of a lot of recycled content, which increases as each year goes by."

So why is Telecom getting into IPTV? "To help us complete the triple play offering to customers; voice, broadband, and video which is now the most powerful new service we'll deliver in an IP world. While customers are interested in bundles this whole notion of on-demand TV is what is turning them on." Telecom's core partners for IPTV are Alcatel and Microsoft although other platforms are being investigated. "There's been a lot of consolidation. Nokia and Siemens have come together, Ericsson bought Tandberg, Cisco bought FibreTech Atlanta and they're developing their own IPTV platform. BT and Simco have also launched IPTV services." Telecom is still looking at set-top boxes, which would need to comply with the studios' requirements and their digital rights management so it won't have a slot for a recordable DVD and even content on the hard disk would be watermarked.

While Telecom was holding back until 2009, Ian Taylor, of Taylormade Media and Animation Research, had already jumped the gun on IPTV, broadcasting from Valencia while covering the 2007 America's Cup races. He found telecomms partners to help cover the Monsoon Cup, a prestigious yacht race held in Malaysia, and covered the 2007 Wanaka aerobatics show. At the Out of the Box – New Broadcasting Futures conference in August, Taylor showed high-resolution TV from Spanish-Australian joint venture dargo.tv. Dargo's web site claimed full-screen HDTV was possibly over a 1.2Mbit/sec link, with the help of client software on the user's machine. Representatives of the Gibson Group also described how they created children's programme *The Simon Eliot Show* from

Eliot's bedroom, featuring live television feeds from camera-equipped PCs supplied to four quiz contestants. Their faces show on cartoon television sets parked on Simon's furniture; the show was broadcast using a dedicated network, provided by Kordia.[46]

WEB SPREADS TO TV

While the statement 'the TV is for TV' used to hold some weight, the PC, laptop, and cellphone soon became second and third screens, and now some Web applications were refocusing on a bigger screen experience. Certainly the lines were blurring. New web sites including Veoh, Joost, and Babelgum were improving video quality, attracting professionally produced content, and transmitting via peer-to-peer technology with advertising included. A number of web sites were working hard to make watching video on-line more like watching television, including software that enlarged the image proportionally to fill the computer or TV screen.

Though YouTube, which attracted home-made entertainment as its staple, had the option of a full-screen mode, video was typically watched in a smaller screen that could be embedded in other sites. "The experience of on-line video is still very poor. Companies like Veoh and Joost are trying to create a more TV-like experience for viewers," said Veoh founder Dmitry Shapiro. Babelgum's slogan was: "TV experience, Internet substance." Veoh touted: "VeohTV makes watching Internet as simple as watching television." Joost simply stated: "The new way of watching TV."

Babelgum planned to embed its platform in set-top boxes by the end of 2008, making its content viewable on traditional TV sets. Apple offered such a box for video purchased on iTunes, and more video companies were expected to follow suit. YouTube, owned by Google, was reportedly considering a TV channel using videos from its web site.

Joost, owned by Janus Friis and Niklas Zennstrom, founders of the Internet telephone company Skype and the music-sharing service Kazaa, had created enough buzz to attract a million beta users by late 2007. "The early stages of video content on the Internet was a lot of user-generated stuff, stuff like my grandmother and her cat ... What we're trying to do is evolve that experience into something that the viewer doesn't view just out of interest, but actually builds an affinity with that particular programming content," said Joost CEO Mike Volpi. Joost had inked deals with Viacom, CBS, CNN, the NHL, Sony, and others.

James McQuivey, Forrester Research TV and media technology analyst, believed people would grow more accustomed to 'long-form' material as it became easier to download. "If there's anything that Joost does, it moves the ball forward ... It tells people that the TV and the PC are not two separate worlds. But as long as we're still mimicking the TV on the PC, we're failing to appreciate the value of combining those two worlds." He said YouTube shouldn't be worried because its interactivity had 'created a social kind of viewing.'[47]

Senior technical specialist and NZNOG member Dean Pemberton was interested to see how the roll-out of broadband helped or hindered video-on-demand or rich media applications. "It's common in some parts of the US where they're closer to the media servers and not paying anything for the bandwidth to get video-on-demand. However you can't download any more than one and a half movies a month on any sort of plan in New Zealand without blowing your cap. Downloading the equivalent of a DVD at 7-9Gb would be more than most people's data caps, without even considering high-definition content at around 20Gb. There certainly needs to be a major change in the billing model or the content delivery model," said Pemberton.

If the content was delivered locally it could be cheaper. "We need to look overseas, see what people are doing and add a little Kiwi ingenuity. That's what TradeMe did. We didn't wait for eBay to start up an eBay.co.nz and we got MySky rather than TiVo. I think we will start to see rich media

moving around the place but it'll be done by New Zealand companies because we're too small for overseas companies to be interested. It's all about getting eyeballs close to the content. The problem at the moment is the content isn't close, so we're having this debate about peering. If every ISP was two hops away from some server that delivered video-on-demand they wouldn't need to bother about peering across exchanges."

Pemberton was keen to see what various ISPs did once true unbundling wass unleashed. "A lot of them have been complaining that lack of access to the local loop is the only thing stopping them from moving ahead. It will be interesting now this is happening whether they put their money where their mouth is. Will they start deploying their own networks and where will they do it? They'll most likely go for the main centres and I don't imagine Napier or Twizel will get a whole lot of choices in terms of DSL2+ provision any time soon."

There's no doubt we were seeing the end of the passive one way take-it-or-leave-it broadcast era. New players were contending for all three screens and while the traditional broadcasters might have an edge on content provision, like Web providers they had to keep it sticky or eyeball attention would wander. State broadcaster TVNZ was already feeling the pinch, posting a $4.5 million loss for 2007 for the first time in its history and warning it would not be returning to the profit levels of the past anytime soon. The broadcaster would not be paying a dividend and continued its incredible shrinking exercise, creating 125 redundancies in the year to June, restructuring costs of $11 million. Advertising was softening and viewer numbers had dropped drastically.[48]

Without greater choice and ultimately an on-demand option where viewers took greater control of their own programming experience, advertiser and viewer loyalty was at risk. The new model was to take the bundle of services that gave you best bang for your telecommunications buck with TV and video services as the ultimate added value; or mix-and-match viewing from all sources using a combination of hard disk–based recorder and management software supplied by broadcasters, independent software developers, or computer companies. The Web opened our eyes; why would you shape your life around the TV set when the potential was now there to shape the viewing experience around your schedule?

It was inevitable the amount of content being created, downloaded, or recorded for later viewing on home entertainment centres would grow exponentially, requiring careful management to free up space. Even terabyte archival storage capacity, previously seen only in large businesses, was finding its way into media-savvy homes. By 2010, once true last mile broadband access was available to competing parties, the digital home would become a real-time node on the high-speed global network, delivering voice, video-on-demand, streaming audio and video, lightning-speed Internet, and a wide range of on-line services for viewing on any number of screens at our leisure.

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Leaping the loop

Cloud cover continues

Society was clearly changing and the Commission for the Future in its 1981 report Network New Zealand recommended a totally revised telephone network that would be able to carry pictures and electronic data as well as voice at acceptable speeds; satellite communications would include not only New Zealand but also the South Pacific; and mobile communications terminals in cars, trains, boats or wherever they were needed. The Commission also pointed out the need for new legislation in areas such as individual privacy, copyright and the flow of data across national borders.
Computer Culture, the information revolution in New Zealand, Colin Beardon, 1985.[1]

It remains my fervent hope that the day will come when the economic benefit of broadband is so well understood that the case does not have to be made.[2]
Ernie Newman, chief executive, TUANZ, June 2007.

Previous politicians essentially privatised a public monopoly and gave it the benefit of a pretty weak regulatory framework that has not served the country well ... I hope Telecom, and other market players, are coming to realise that a series of short-term profit-maximising decisions must, in the end, be squared away with the long-term national interest.
Communications Minister David Cunliffe, 2006.[3]

The Internet in New Zealand was at a watershed, with the government laying down a regulatory roadmap that opened up Telecom's network to competitors and split the giant carrier into separate wholesale, retail, and network companies.

There was a certain irony in the fact that 20 years previously the old Post Office, which had a monopoly on everything from phone and data calls to snail mail – having failed to sufficiently future-proof – faced an identical challenge. In 1986 the Mason-Morris *Post Office Review* recommended

Theresa Gattung and Roderick Deane resigned within a year of each other.

splitting the state-owned behemoth into three separately managed businesses, a decision that was implemented the following year.[4]

In June 2006, the same month Telecom chief executive Theresa Gattung handed in her resignation, the policies set out in the Telecommunications Stocktake Review, including unbundling the local loop, were introduced to parliament. The Telecommunications Amendment Bill passed into law in December with a massive 119 votes to two, taking the original plan further by mandating the operational separation of Telecom.

In 21st century New Zealand the newly re-regulated environment would be framed by strong competition guidelines and new leadership at Telecom's helm. Serious investment was necessary – some said several billion dollars – to get the country back on the developed world broadband map. There would be a major review of the Kiwi Share obligations, a big push to get equitable access to broadband in rural areas; the cellular networks were in for a shake-up to promote greater competition and lower prices, and number portability would come into operation, enabling customers to keep the same phone number if they changed cellular or fixed-line networks.

While Telecom had opened up the throttle on wholesale broadband deals, everyone was waiting for the next step, which would free up access to Telecom exchanges for competitors to install their own equipment and introduce wholly independent services. The big concern would be how much life the copper network had left in it before fibre and other options superceded its capabilities.

Financial adviser Citigroup seemed to think structural separation of Telecom wasn't such a bad thing. The crucial factor was the price the government would set for competitors to access its copper network. Some analysts predicted $15–$25 per month while Citigroup estimated $31. Telecom had been weighing the numbers against the investment needed to meet the government's broadband penetration requirements. One suggestion had the figure at $8 billion above current investment plans to achieve speeds of 20Mbit/sec to 100 percent of customers.

Telecom claimed it was on track to deliver 20Mbit/sec to about 30 percent of customers by 2011. "Numbers like $100 million are doable, $3 billion less so. If the government wants to target higher levels of penetration or performance there's a gap that needs filling," said Telecom CFO Marko Bogoievski.[5] Telecom had stated clearly in its 2006 annual report that it was committed to driving increased broadband penetration with a new target of 500,000 retail broadband customers by the end of 2007.

"We must at the same time remain commercial in our approach to investment; the economics of delivering higher speed broadband to non-metropolitan areas are very challenging. To counter this, Telecom will be pursuing a technology-of-best-fit approach to investment, recognising technologies other than DSL, such as 3G mobile, WiMax, and satellite, as more efficient means of delivering broadband to some regions."[6]

ISPS BURNING CASH

Telecommunications analyst Phil Harpur of Paul Budde Communications said regulatory changes had seen the pendulum swing back slightly towards second-tier ISPs in the retail broadband market. However Telecom's stranglehold on network access had meant the move to open up its networks

to competition had come far too late for ISPs struggling to survive on slim margins. Successful operational separation of Telecom would be the key to creating a more level playing field for the rest of the market. The period through to early 2009 would be crucial. "A lot rides on the government in making sure that Telecom fully co-operates in the regulatory process."[7]

Orcon founder and chief executive Seeby Woodhouse was pleased at the prospect of the new environment opening up but frustrated at the time it was taking for the local loop to be unbundled. "The original dates proposed are starting to slip. Telecom's had nearly two years where they've known this has to happen … I think everyone's doing the best they can; it just needs to happen faster."

ISPs saw the new regime, including an operationally separated Telecom, as a chance to return to decent margins and profitability. "The issue is we're not really making any money on broadband, and in some cases we're paying more to purchase the wholesale product at cost, than Telecom retail customers … We have a certain amount of cash burn we can sustain and if LLU doesn't happen in a reasonable timeframe then a number of ISPs will be out of business," said Woodhouse.[8]

While restating its commitment to reducing the price of phone calls, Telecom announced in mid-January that monthly phone line rentals would increase by $1–$1.85. While it claimed the cost of national toll calls was on average 16 percent cheaper than in 2004, and international calling was 28 percent cheaper,[9] it said rising business costs and inflation had driven the move. However telecommunications researcher Paul Budde said the argument was flawed. "Prices in technology are dropping and dropping and dropping, and so it's very difficult to argue that these prices should go up." Line rental charges in Christchurch and Wellington would be $7.60 cheaper than in other areas, but only because that was where Telecom faced competition from TelstraClear.[10]

The Commerce Commission had asked the Telecommunications Carriers' Forum (TCF) to help prioritise tasks around LLU and naked DSL (NDSL) which gave competitors unconstrained access to Telecom's network. The industry had reached a stalemate on priorities, with those planning to build their own infrastructure favouring LLU and resellers preferring NDSL which appeared to be the easier of the two to implement.

TUANZ chief executive Ernie Newman said public expectations of improved telecommunications services had been raised and there was a growing impatience to get on with it. "We would like to see NDSL as a separate workstream so some of those new services can be brought to market now, and tangible benefits realised sooner. The more substantial long-term benefits of LLU will follow." WorldxChange and CallPlus wanted NDSL to be given priority but Ihug and Orcon favoured LLU.[11]

Within weeks submissions were being received by the TCF. Then Ernie Newman dropped a wildcard, asking for greater clarity around suitable back-haul capacity for carriers who wanted to use Telecom's network to get into smaller towns and rural areas. "Suppose CallPlus decided they were going to do a foray into Eketahuna and they got 100 broadband customers on the unbundled local loop and all of a sudden there was no exchange back-haul capacity to get that traffic to and from Masterton. Suppose CallPlus didn't want to invest in that and Telecom said, 'They are not our customers, why should we invest?.' What then is the process?" In a submission to the TCF, the lobby group said unbundling would be 'fatally flawed' if a way wasn't found to deal with such situations.

In 2006 Telecom had offered to increase investment in its back-haul network by spending 'hundreds of millions of dollars' rolling out fibre-optic cable to almost all towns, but that offer was withdrawn when the government decided to regulate. TUANZ said without considering how back haul would be provided in regional centres and towns, unbundling would have little or no benefit anywhere other than the main CBDs. "Regional broadband will receive no benefit from the decision to unbundle the local loop and the digital divide will continue."[12]

Freeman Media commentator Matt Freeman echoed industry frustrations with the delays. "It is believed by many that a finite window of opportunity exists for LLU services, a technology we're already playing catch-up with the rest of the world on. Telecom's multi-billion-dollar Alcatel-Lucent Next Generation Network is scheduled for completion by 2012 and the roll-out is already well under way. Some predict the carrier will begin rolling out converged consumer IP services by early in 2008 which could render LLU redundant."

NUMBERS REMAIN FLAT

Another major shift in the wind was the arrival of number portability. The Commerce Commission ruled on its introduction in August 2006, removing one of the last barriers for customers to switch phone companies. From April 2007 consumers would be able to keep their fixed-line and mobile numbers when changing phone companies. It was understood the industry as a whole had spent about $100 million to prepare networks for the change. Telecom alone had invested $48 million.

At stake were total fixed-line revenues worth $8 billion a year and cellphone revenues of $2 billion. Vodafone's Tom Chignell said number portability was a key part of its attack on Telecom's voice market. It would allow Telecom customers to keep their fixed-lined home and business numbers if they moved to Vodafone's new home phone service, where cellphones could be used in place of landlines.

Vodafone was also launching free local calls between its cellular network and Telecom's fixed lines and increasing network capacity backed up by its ownership of Ihug. Ihug regulatory manager David Diprose said it had been testing portability equipment with TelstraClear and Telecom. "When we get local loop unbundling near the end of the year, it will make a huge difference; we will be able to take all those customers without changing their home number."[13]

Commenting on broadband penetration figures had become something of an industry art form, particularly since 2004 when the government set the impossibly tough challenge of attaining a position in the top quarter of the OECD top 30. The numbers and benchmark conditions were confusing at best. The goalposts shifted; it was 10Mbit/sec pre-Digital Strategy, then 5Mbit/sec, and now it seemed safer but nonetheless distant to aim for the top half of the OECD.

In the meantime all those OECD surveys didn't really add anything to the mix other than to tell us, apart from the occasional blip on the heart monitor, that we had been virtually flatlining for almost a decade compared to most of the other developed nations. The March 2006 numbers showed relief for the first time in four years. We had clawed back three places to come 19th. Should we be excited? Despite all the activity going on to try to provide better-quality, higher-speed broadband in a more competitive market, there was no evidence of a major surge.

Statistics New Zealand reported 26.6 percent growth in broadband subscribers in its ISP survey to 30 September 2006, taking the number to 611,600. The survey for the following six months to 31 March, 2007 showed a further increase in broadband number, up 18.5 percent to 724,600. But uptake had generally slowed for the two periods and was still way short of the 980,000 subscribers needed to get even close to the original 2007 mid-point goal. It was also a long way from the two million needed to hit the government's 2010 broadband target. Dial-up still dominated, with 739,700 subscribers, representing 50.5 percent of all Internet users – a slight fall of 4.1 percent. The survey of New Zealand's 57 ISPs showed there were 1.46 million Internet subscribers at 31 March 2007 – an overall increase of 5.9 percent.[14] There appeared to be fractional overall growth, most of it new broadband business and a little churn from dial-up to fast Internet.

Clearly improvements in pricing and plans for broadband were helpful, and while InternetNZ executive director Keith Davidson predicted broadband could overtake dial-up by the end of

2007, he was disappointed that 97.6 percent of broadband subscribers had data caps and 68.6 percent had a cap of less than 5Gb per month. "With 60 percent of DSL subscribers having download speeds of less than 256kbit/sec and 90 percent having upload speeds of less than 256kbit/sec, we have a long way to go before New Zealanders are able to experience the full potential of broadband."[15]

Another OECD report in March delivered more of the kind of news that had encouraged the government to step into regulation mode. It concluded, owning a landline in New Zealand was more expensive than in most other countries and cellphone users were also paying prices well above average. It said 'a significant gap,' remained between prices in New Zealand and countries in the top half of the 30 OECD countries.

Consumer groups weren't surprised with the evidence New Zealand was still lagging. The report, which pre-dated the Telecommunications Amendment Act, used figures to June 2006 showing good broadband coverage but poor uptake. Broadband access was available to 95 percent of New Zealand homes, with uptake of 11.7 percent, up from 10.9 percent in 2005.

Telecommunications Minister David Cunliffe agreed the market had become stagnant. "We are in a competitive international race and our relative performance has not improved." The figures, he said, showed the government was right to intervene. "We are working hard and fast to ensure Kiwis get the internationally competitive services we need for our economic transformation." Consumers Institute chief executive David Russell described the results as 'predictable' saying the 'poor old Kiwi consumer' continued to pay a heavy price, especially for mobile phones.[16]

However the government's telecommunications reforms did seem to be having some impact, even if it was largely to do with attitudes; certainly fewer competitors perceived regulation as a barrier to growth. A Statistics New Zealand survey showed just 42 percent of ISPs by March 2007 believed the regulatory environment was still an impediment compared to March 2005 data which showed 73 percent of ISPs bemoaning lack of regulation and competition as preventing business growth.

The second quarter 2007 OECD broadband numbers showed more of the same. It was positive, heading in the right direction but oh so glacial. So how do you make a glacier sound as though it's careening ahead? How about this: New Zealand had doubled its broadband penetration rates from 8.07 connections per 100 people in the final quarter of 2005 to 16.5 percent penetration by the second quarter of 2007. Wow. Enough to make the blood rush to your head. By June 2007 New Zealand was back at 20th out of 30 OECD countries, with 683,500 broadband subscribers (16.5 percent). Even Statistics New Zealand had offered better numbers than that for the March quarter and it wouldn't be releasing any new numbers for months.

What was left to say? InternetNZ public policy committee chairman David Farrar said the one point increment was 'encouraging' but New Zealand was still playing catch-up with most of the rest of the developed world. There must be a dramatic increase in uptake if we were to achieve the Digital Strategy goals.[17] "New Zealand has made some gains; we are the ninth fastest growing OECD country in terms of broadband penetration, with a net increase of 4.94 subscribers per 100 inhabitants." We also ranked 15th on pricing, with an average monthly subscription of $NZ63 for October 2007.[18]

Recent regulatory reforms would play an important role in driving up penetration rates. However moving up the OECD rankings would also require sustained investment in more sophisticated broadband technologies, including deployment of high-speed fibre. "Fibre represents 8 percent of all broadband connections in the OECD. This is the race of the future and we are yet to get to the starting gate, while others are already a third of the way around the course," said Farrar.[19]

BACKWARDS IN GOING FORWARD

With unbundling just over the horizon and open slather accounts on offering, subscribers were being bombarded with offers from ISPs eager to win their business before the next wave of competition. In some parts of the country there were long delays in getting broadband connections and those who had upgraded to the new 'all-you-can-eat' packages weren't exactly getting what they paid for.

In fact up to 40,000 people – 10 percent of Telecom's 395,000 retail broadband customers – who had paid for faster broadband, had seen performance slow markedly. The Commerce Commission was investigating 'a stream of complaints' from people claiming they had been misled by Telecom's advertising, since broadband was 'unleashed' in 2006.

Auckland arts patron and millionaire Jenny Gibbs was frustrated at being unable to get broadband at her opulent Paritai Drive home in Auckland despite the advertising spin. New units needed to be installed in cabinets near her street to boost capacity. Auckland broadband user Ron Johnson upgraded to Telecom's Go Large package in October 2006 but despite paying more, he got less. "I've got Go Large and I've gone backwards," he said. His speed had dropped from 400kbit/sec to 60kbit/sec and he was told he couldn't go back to his old plan. Telecom eventually admitted it was having problems with 'this particular plan.'[20]

The failure to deliver on its broadband promises earned Telecom's ISP Xtra the Consumer Institute's Supreme Ass Award, in the inaugural Complete Ass Awards for bad products and services. Institute executive director David Russell said that since Telecom 'unleashed' its broadband speeds, the institute had been 'inundated with complaints of slower speeds and frustrating cut-outs.' To make matters worse, "you can't switch on the telly or open the paper without being confronted by the leering geek band, the Xtraordinaries, proclaiming unlimited broadband speeds and no data caps."[21]

Telecom agreed to credit its Go Large customers up to a total of $8.5 million after admitting they were not receiving the speeds originally promised. An internal technical review had identified an issue with how Internet traffic was being managed on the plan. Go Large was introduced in October 2006 with no cap on downloads. It had around 60,000 customers and no more were taken on until Telecom sorted things out.[22]

Then Telecom was voted runner-up in the worst transnational corporation operating in New Zealand at the annual Roger Awards in Wellington at the end of March.

Australian-owned Progressive Enterprises was named worst company because of the 28-day lockout of more than 500 supermarket distribution workers in August and September. The judges said in their report that runner-up Telecom "continued to disappoint customers, argue every point with regulators, and so totally mismanage the roll-out of 'faster cheaper broadband' while frustrating its competitors that it probably cost New Zealand a fortune in lost opportunities."[23]

TRIAL SEPARATION DRAMAS

In the first week of April, David Cunliffe began laying out the specifics for Telecom to comply with the new Telecommunications Amendment Act, stating the proposed three-way way split between wholesale, retail and network access divisions would be cleaner than the British Telecom model. BT had voluntarily split its wholesale and retail operations under pressure from Ofcom, the UK regulator.

An independent oversight group (IOG) would be appointed, and in conjunction with the Commerce Commission would keep an eye on progress. While the network group would have common ownership it would be institutionally separate with its own brand and location.[24] However Telecom insisted the proposal was far too complicated, unworkable and failed to address questions surrounding future investment.

Telecom chairman Wayne Boyd complained it was more complex than the British Telecom model. "The emphasis on a strict form of separation is inconsistent with the desire of our wholesale customers to see new regulated services placed into the market as soon as possible. The complicated separation requirements add unnecessary cost, and propose governance arrangements that are unworkable within a single entity."

Besides, there were no incentives for future investment.

> *The telecommunications industry is at a critical juncture and is facing a significant amount of future broadband investment. The proposed form of operational separation creates an independent, but unsustainable access network services unit that has no capability or incentive to invest … It effectively proposes a structural separation with none of the advantages of improved regulatory certainty. This outcome is untenable for Telecom shareholders and in our view will not deliver on the Digital Strategy objectives New Zealanders are seeking.*[25]

The separation issue dragged on, with Telecom proposing the option of selling off the network division into a partnership with industry players or the government, thereby divorcing it from the rest of its business. There were concerns this wasn't a future-proof solution as it didn't include the electronics that allowed the network to function. Telecom CFO Mark Bogoievski said the proposal had the potential to simplify the regulatory framework if owned by a third party. It would free up Telecom's retail model to compete and innovate. He said Telecom would not be able to invest adequately in fibre networks under the government's proposal because of the costs of separation.[26]

Bogoievski told the *Sunday Star Times* he thought the government and the industry were staring at "quite a high profile policy failure if we don't get this right." The Telecom counter-proposal specifically committed to faster delivery of naked DSL and LLU, with the first generation of those services in the market during 2007, unless Telecom's resources became tied up in a complex operational separation scheme. The government wanted 90 percent of New Zealanders to have access to broadband speeds of 5Mbit/sec by 2010, but Telecom insisted it was pie in the sky for David Cunliffe to plough ahead with the original scheme.

IT and Communications Minister David Cunliffe who presided over the radical re-regulation of the telecommunications sector

Chairman Wayne Boyd said the company was only prepared to invest a third of the $1.5 billion required if the government's plan for operational separation was adopted.[27]

InternetNZ's executive director Keith Davidson wasn't happy Telecom had ignored what it had been asked to submit on, but the society nonetheless were 'secret admirers of the plan.' The problem for Telecom was it had 'continually sacrificed long-term investment in order to achieve its short-term profit goal,' partly he said, a response to the sharemarket and senior management wanting to get their annual bonus. "They've horribly under-invested in New Zealand infrastructure so in separating out the network company, where the entire focus is on the infrastructural layer, they can't help but look at the long-term view and I think they'll get the drivers and incentives exactly right. You will never get that while Telecom has a single board and a single management structure that controls the wholesale, network and the retail divisions. The drivers are just completely wrong."

CABLE CAPACITY CHALLENGED

As the regulatory environment became less of a barrier to ISP growth the need for international bandwidth again become a major issue as the bulk of data being viewed by Kiwi surfers originated offshore, most of it travelling across the now overloaded Southern Cross cable.

A surge in demand for bandwidth, largely from video-hungry users in Australia and eager broadband users in New Zealand, had accelerated the need for a major upgrade, at a cost of tens of millions of dollars.

The declining capacity available on the undersea communications lifeline that handled the bulk of Internet traffic between New Zealand, Australia, Hawaii and the United States became so serious an announcement was made in February that capacity would need to be doubled. Space on the Southern Cross cable was nearly sold out, so 50 percent owner Telecom contracted Alcatel to increase the capacity of each leg of the 28,900km cable from 240Gbit/sec to 330Gbit/sec by April 2007.

Another boost to 430Gbit/sec would occur by the end of 2008. Termination equipment would be upgraded in New Zealand and if necessary a further capacity increase could occur to take the light-speed lifeline to 1.2 terabits. Southern Cross, which is operationally based in New Zealand, recorded over US$320m in sales in the second half of 2006. The cable laid for US$1.3 billion in 1999 was last expanded in January 2003.

Southern Cross sales and marketing director Ross Pfeffer said users were increasingly moving to a "video-dominated on-line world requiring very high access speeds." With exploding demand for bandwidth in Australia as a result of consumer take-up of superfast broadband technology ADSL2+, Southern Cross needed to act quickly.

Some relief could also be provided by the fact that Telstra, Southern Cross' largest customer, was building its own cable from Sydney to Hawaii.[28] It planned to withdraw from the Southern Cross cable once its new trans-Pacific undersea route was completed. In fact it looked as though Telecom had serious competition. Telstra's project running through Hawaii and Guam, expected to cost hundreds of millions of dollars, would deliver 1.28 terabits capacity and was due for completion in 2008.

Telstra chief operating officer Greg Winn said the new cable would

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'significantly reduce' Telstra's reliance on 'foreign-owned companies' to provide its international bandwidth and compete globally. Meanwhile Perth-based Pipe Networks was planning to lay another fibre-optic cable from Australia to Guam, where it would link with other undersea cables. Project Runway was expected to cost NZ$227 million.[29] New Caledonia carrier OPT was also building a cable between Sydney and Noumea with a potential 300Gbit/sec capacity, large enough that some have suggested it could be extended to further destinations.

A further boost to international capabilities would be delivered by the Optus D2 satellite, which was launched in October, providing direct TV broadcast, Internet, telephone and data transmission services for Australia and New Zealand. Weighing 2350kg at launch, Optus D2 was fitted with 24 Ku-band transponders and had a design life of 15 years.

In December winds reaching 130km an hour battered the Oregon and Washington coasts in the United States damaging the Southern Cross cable network and reducing Telecom's international capacity by 50 percent until the cable could be repaired.[30]

SPLIT HITS THE FAN

At the end of 1995 InternetNZ had been invited to participate in the government's stock-take of the telecommunications sector, largely because the previous year it had taken a Commerce Commission case to try to establish the wholesale price of DSL broadband. Keith Davidson said at that point Telecom was charging $2400 month for a full-speed business DSL connection when the wholesale price was going to be just under $30. "This certainly gave an indication Telecom was using the market for more than just profiteering." InternetNZ had worked closely with ISPs and others in recommending LLU, naked DSL and operational separation to try to ensure more reasonable competition.

Naked DSL – also known as unbundled bitstream access (UBA) – on an unencumbered broadband line would allow a true alternative to Telecom's fixed-line telephone and Internet services. Over time Telecom would develop multi-tier systems allowing wholesale broadband at different speeds for different services. In conjunction with the TCF, Telecom eventually signed off on a proposal for its wholesale clients but the framework for wider access was taking too long so the Commerce Commission stepped in.[31] Telecom was still looking for certainty on whether its pricing met the Commission's requirements. Meanwhile phone and Internet companies, frustrated at the delays, were lobbying the Commission to get a move on with the rules for unbundling.

InternetNZ's Davidson remained concerned but could understand the caution. "This is New Zealand's largest company and you know it needs to be handled with some care so the sharemarket doesn't go into panic." However he believed the ISP industry was suffering and would continue to feel the pain until they got a more level playing field.

Then Telecom's objections to the structural separation plan and its last minute proposals to do things its own way had sparked a backlash. Both InternetNZ and ISPANZ found Telecom's approach unworkable and unacceptable. In its submission ISPANZ said Telecom's proposal had the potential to stall other telecommunications reform, and that LLU and naked DSL were 'top priorities.' ISPANZ, representing the majority of Telecom's ISP customers, believed the MED should ditch Telecom's proposal and proceed 'with some urgency' on the operational separation process. It wondered,

if Telecom thought its approach was such a good one, why it hadn't put it forward at the time legislation was being formed?

While Telecom had complained about complex government recommendations, InternetNZ pronounced 'the complexity of changes' required for legislation under Telecom's proposal could take more than 12 months to enact. "On top of that, Telecom's proposal would weaken the equivalence obligations at the core of the model, particularly for Telecom Wholesale. This would reduce the prospect of investment by newcomers, an outcome that nobody wants," said InternetNZ deputy executive director Jordan Carter.[32] InternetNZ lodged a further submission in mid-May, arguing that Telecom's proposal didn't provide a basis for further consideration. "Telecom's submission didn't provide evidence for why the government's approach was wrong, and its proposals to change the regulatory framework would have been a step backwards, harming future competition in the access network."

The issues were canvassed in some detail at the 2007 TUANZ Telecommunications Day on 31 May, which saw several announcements, including the naming the new Telecommunications Commissioner Dr Ross Patterson, a lawyer from Minter Ellison Lawyers in Sydney. Taking up his role from mid-July, he would play a pivotal role in implementing and monitoring the new telecommunications regime. The government also made it clear that operational separation would be proceeding. InternetNZ maintained a clean separation was vital to future telecommunications industry competition. International experience showed that more competition would drive more investment, regardless of statements to the contrary by incumbents.[33]

UNDER NEW MANAGEMENT

Telecom's chairman, Roderick Deane, nicknamed 'Doctor Death' for his ability to wield the knife when it came to restructuring and making the hard decisions, had announced his resignation at the end of May 2006. He got a golden handshake of $661,000.[34] Having joined Telecom as CEO in 1992 Deane had spent 14 years on the Telecom board. His departure was celebrated in an editorial in the *Christchurch Press*:

That change was essential at Telecom goes without saying, and the glee was widespread at the sight of its bloated arrogance being punctured by the network-unbundling announcement. The debate over the merits of using the regulatory approach to force its hand is now academic. It seems Telecom itself has grasped that point … But he (Deane) also represents a past that Telecom now needs to shake free of – one where confrontation, obfuscation, litigation and bullying have too readily been preferred to engaging with customers, regulators and, on the occasions when it might have been the best course, competitors … Theresa Gattung faces similar guilt by association with that tarnished past. It is little wonder that predictions of her departure are only mounting…[35]

Telecom CEO Theresa Gattung who had been elevated from the Telecom marketing department and groomed by Deane to step into his CEO shoes in 1999, handed in her resignation within weeks of her mentor. She resigned on 31 June 2006 after seven years at the helm of the country's largest listed company. Gattung planned to stick around for at least another nine months to oversee changes in policy. Telecom's board of directors quickly scoped out the world market for a replacement. Chief financial officer Marko Bogoievski was

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considered an obvious choice by some but others blamed him for the dramatic fall in Telecom's market share over the previous year.

Gattung, the first woman in New Zealand to hold the chief executive role in such a major company, admitted 2006 had been her worst year, after Telecom lost billions of dollars in market value through the changing regulatory environment. Share prices took a dive with the leaked news of the government's unbundling plans and it had been forced to wipe $1.1 billion from AAPT, its loss-making subsidiary in Australia. John Goulter, her long-time communications adviser, was also exiting as was government regulatory affairs manager Bruce Parkes, another indication of a major change in the old guard.

TELECOM'S OBITUARY

Long-time IT journalist and *NZ Herald* writer Chris Barton held nothing back in his swansong for the departing management team at Telecom.

So it's goodbye at last to Roderick, Theresa, Bruce and John – the former Telecom quartet I've crossed swords with for more than 15 years of so-called telecommunications reform … Roderick Deane became Telecom chief executive in 1992 and is the architect of the regime that has deprived New Zealanders of a decent telecommunications service. His strategy was simple. Deane would build Fortress Telecom from which he and his cohorts would block, stall or mitigate every regulatory and competitive threat while they duped and ripped off a hapless public. For many years he had a free ride as successive governments agreed with the idea of light-handed regulation – none more so than National communications minister Maurice Williamson, who seemed like a puppet in Deane's hands.

Gradually governments began to realise that when it comes to essential infrastructure, leaving its destiny to market forces is a really stupid idea. Laissez faire economics in the telecommunications market simply reinforces the power of the incumbent monopoly and competition is strangled as soon as it sprouts. Deane groomed Theresa Gattung and Bruce Parkes in his fortress mentality – and the pair, she as chief executive and he as head of government relations, were formidable. She was loud and gauche and he was goofy and affable, but both were ruthless in their battle against regulation. They were joined six years ago by spinmeister John Goulter, Telecom's chief apologist for its anti-competitive ways, who, by the end of his tenure, had perfected the art of saying black was white to the point where I think he believed it…

All the while Deane was in the background as Telecom chairman, advising his protégés and laying down the law with government ministers. You could argue he was the most powerful person in New Zealand. He was like a smiling assassin calmly drawing his opponents close – so they could smell his aftershave – while he quietly said "no." The ways Telecom has abused its monopoly power and engaged in anticompetitive practices are too many to mention. But the one that stands out for me was the infamous "0867" scheme – a 2c per minute tax Telecom unilaterally imposed on dial-up Internet users in 1999 if they didn't dial that prefix.

It was the brainchild of Parkes, designed to stop competing Internet providers who were taking Telecom customers

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in droves. The plan was the subject of High Court cases and injunctions which Telecom lost. It is still before the court in action taken by the Commerce Commission for breach of the Commerce Act. But it didn't bother Telecom. Despite having to make out-of-court settlements Telecom still won because once again it had obfuscated and delayed enough to cripple competitors.

Telecom's influence knew no bounds. In 2004 when it was clear to all that Telecom's monopoly on residential phone lines must be opened to competition, Telecommunications Commissioner Douglas Webb's ordered against local loop unbundling – even though a detailed report by his own office advised in its favour. To this day no one has been able to explain why Webb performed his incomprehensible back flip.

But now as Roderick, Theresa, Bruce, and John depart, I feel compelled to question their ethics. Some would say they were just doing their job – in fact doing it very well. But thanks to their sterling work, their legacy is that while the rest of the world races ahead with faster, cheaper, and unlimited broadband, not to mention voice services that are almost free, New Zealand in 2007 has a telecommunications system that's the equivalent of the party phone lines of the early 60s. Yes, I am angry.[36]

During her final year with Telecom the 45-year-old who had held one of New Zealand's most powerful and high profile positions, with a pay packet of \$2.9 million, was given a special bonus pay of \$1.8 million. By the year ended 30 June 2007 she had received a total of \$5.4 million including base salary, performance incentives, long-term incentives and \$287,000 in unpaid annual leave. Months after her departure Gattung was reported to have sold Telecom shares worth \$770,000.[37]

OUT WITH THE OLD

Speaking in Sydney ahead of stepping into the new role in October, Paul Reynolds, Telecom's new chief executive said he believed there was much scope for Telecom and the New Zealand communications business in general to grow, if the company got it right for its customers. Reynolds, who had been running the wholesale division of British Telecom, believed customers were better off after strong separation of the networks and retail divisions of his former employer. He had been a key player in the overhaul of BT's networks and information technology systems, which the company called 21st century network (21CN).

He had beaten two internal candidates to the Telecom role, finance chief Marko Bogoievski and operations chief Simon Moutter. Bogoievski effectively ruled himself out after disagreeing on the path the board was taking with the company's structure.[38] He handed in his resignation at the end of August 2007, after more than seven years with Telecom.

It was believed Reynolds preferred to work with the government rather than pursue Telecom's 'aggressive' resistance to giving competitors access to the local loop. Bogoievski was among those opposed to the plan to split Telecom into three businesses and was responsible for the press release describing the government's proposal as 'fundamentally unworkable' and uneconomic.

According to the *Dominion Post*, Bogoievski and other senior managers wanted to continue fighting greater

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government intervention, which was at odds with the board and caused a great deal of tension. According to Telecom's annual report for the year to June 2006, Bogoievski received $1.29 million cash and $849,000 in equity-based remuneration, making a total of $2.14 million.[39]

Weeks later Kevin Kenrick, chief operating officer of Telecom's consumer arm, announced his departure following a 'storm of criticism' from consumers about the handling of its new Yahoo! Xtra Bubble service. In August Telecom's loudly trumpeted upgrades and additions to its email service and web site turned into a disaster. The new customised bundle of services from Yahoo! announced in February, due for launch in June and finally offered in August, put Xtra customers through horrific inconvenience.

A couple of days after the outage Telecom claimed it had resolved the registration fault which had "affected some customers' ability to access the service." It had added more people at call centres to assist customers who still had problems.[40] The downplaying of the impact incensed the *NZ Herald*'s editorial writer:

Telecom customers would be justified in believing that the company has taken its strategy of confusion in the marketplace to a new level. Now it sows anger as well as confusion. It was not just that it managed to make a hash of upgrading to Yahoo!Xtra Bubble, it was the attitude afterwards of not seeming to care that thousands had been seriously inconvenienced. At first it played down the problem, saying a fault had affected 'some customers' ability to access Webmail. What this piece of corporate doublespeak meant was that thousands had been cut off at the weekend. Five days later hundreds remained without the email service they rely on for their businesses. Making everything so much worse, was the insensitive way that Telecom glossed over the problem. It was well nigh impossible to get help or information. Telecom declared it would not compensate businesses. Worse it went on trumpeting the exciting new Bubble service that would supposedly change the way subscribers used the Internet. But disgruntled customers were not buying it and hundreds expressed their anger – and explained the enormous personal and business cost – in public forums such as Herald On-line. But mid-week Telecom was prepared to talk about compensation after all…[41]

After a period of denial and confusion Telecom made an overt apology, offering to provide all its Xtra customers one week's free Internet access – around $5–$6 million – and donate $1 million to charitable organisations voted on by those customers. Kenrick was forced to admit the service had got off to 'a miserable start.' It was the second time Telecom had been forced to apologise, after it credited 60,000 customers between $130 and $160 each when its Go Large broadband service failed to perform as advertised.

Kenrick's departure came just weeks ahead of Scotsman Paul Reynolds taking the helm. He had grown Xtra's business and regained lost market share in the mobile business after joining the company in 1999 as a sales and marketing manager for Xtra.[42] Within a week of his resignation, Kenrick was announced as the new chief executive of House of Travel, the country's largest privately owned travel company.

Paul Budde, communications researcher.

THE NAKED TRUTH

A year after the government announced Telecom would have to open its network to competitors, there were was a general sense that an Internet revolution was finally on its way. The first ISPs were still trying to work out the specifics of LLU and naked DSL services but confident they would be testing their equipment on Telecom's exchanges by mid-year, although the hype about major roll-outs had been tempered during the long wait for action.

Telecom's wholesale manager Matt Crocket was credited with ensuring ISPs and carriers engaged in a smooth waltz across the slippery territory rather than acting like head bangers at a rock concert.[43] TUANZ chief Ernie Newman conceded a change in attitude by Telecom, and according to CallPlus chief executive Martin Wylie there was every indication Telecom was trying to treat its competitors more like customers. However the really tough stuff was still ahead, and the crunch would come around the commercial terms Telecom would offer other operators.

Telecom's threats to cut back proposed investment in infrastructure and focus less on unbundling progress if it was forced to separate left an undercurrent of concern. Telecommunications analyst Paul Budde said there was a fine line between feeling sympathy for Telecom and his gut feeling that it was continuing to use its old tactics to delay and frustrate. He cautioned against looking to the Australian model where Telstra had used the courts to hold up unbundling for seven years and still vigorously campaigned against alternative networks. While New Zealand was still debating the details of LLU, most countries had already been through that process and were now unbundling fibre-to-the-node networks, which would make LLU technology obsolete.

Smaller ISPs also had reservations about the emerging environment. Ihug CEO Mark Rushworth said delays would be felt acutely by those operating on thin margins. "If you don't get big, you get bought because you need scale for LLU." TelstraClear chief executive Dr Allan Freeth said if carriers were serious about providing an alternative service they needed to invest \$200–\$300 million. It was inevitable there would be rationalisation and consolidation over the next three years.[44]

Freeth sided with Telecom over the desire for more regulatory certainty before investing in broadband infrastructure. Telecom's fibre-to-the-node proposal, seen as the most viable option to lift broadband performance, would help TelstraClear achieve better coverage and get fibre closer to customers. TelstraClear wanted open and equivalent access. "This isn't a debate about being an incumbent or a challenger. It's about sensible investment and returns, with regulation that gives companies the confidence to commit to the huge sums needed to transform broadband in New Zealand," said Freeth, a day before operational separation submissions closed.[45]

Outgoing Telecom chief Theresa Gattung put her spoke back in, recommending the government spend hundreds of millions of dollars in partnership with phone companies if it wanted more rapid and wider deployment of fast broadband. It would cost \$1.5 billion to give most people a high-speed broadband Internet service, but Gattung said industry would cover only part of that, because of the high cost and uncertain revenues from the investment. It would be 'reasonable' for the government to lead investment in broadband to lift economic performance, in the same way the state spent money on roads.

Telecom planned to spend about \$500 million on the Digital Strategy target to ensure 90 percent of New Zealand got access to least 5Mbit/sec by 2010. She said it was highly expensive to

run fibre-optic cable from Telecom's phone exchanges to about 7000 roadside cabinets, and there was a deficit of about $1 billion that needed to be covered by other companies or the government in some form of partnership. "It is reasonable for (the government) to lead investment on." If it were left to the industry, getting high-speed broadband throughout the country "would take much, much longer," said Gattung.[46]

EXCHANGE RATE

Telecom planned an 'aggressive' implementation of LLU and co-location at 40 key Telecom exchanges within 14 months from the final determination, according to documents obtained by on-line telecomms publication *The Line*. The paper submitted to the Commerce Commission outlined a three-month soft launch to five exchanges, where access seekers would be able to install their equipment 65 days from the final determination.

Telecom would consult with the industry on which exchanges would pilot the scheme to monitor technical and operational details. Service level agreements (SLAs) would outline conditions for access seekers, and there would be financial penalties if Telecom's own performance levels were not met. Telecom had provided access seekers – also be subject to SLAs – with technical audits for 43 exchanges as agreed with the Telecommunications Carriers' Forum and begun discussions about co-location trials.[47] The Commerce Commission would be consulted before the rules were set in cement, sometime before 9 November and the 'soft launch' of LLU. Full LLU could be expected between March and June 2008.[48]

At the June 2007 Telecommunications and ICT Summit, David Cunliffe again affirmed world-class broadband performance was essential for our economic transformation and a prosperous future. Sitting back up at 21st out of 30 OECD countries for broadband penetration and 22nd for ICT infrastructure investment per capita was simply not good enough. The government would not stand idle he said, if there was any "indication of prevarication."

Cunliffe said it was essential to future proof the regulatory environment. "Previous politicians essentially privatised a public monopoly and gave it the benefit of a pretty weak regulatory framework that has not served the country well." However, he said, the government was responsible for ensuring private interests aligned with the public good. "I hope Telecom and other market players are coming to realise that a series of short-term profit-maximising decisions must, in the end, be squared away with the long-term national interest."

Within days the government relaxed its tough stance on operational separation, saying there was potential to go with the approach Telecom had been pushing. Was this a major about turn? Only a month previously Cunliffe had stated structural separation 'must not divert us from implementing operational separation.' Now it seemed the government was discussing whether Telecom's approach had potential to better meet the aims and objectives of the Telecommunications Act.[49]

Then the announcements came free and fast. Cunliffe was in fact still debating the preferred mode of separation, Telecom's wholesale customers were told to expect naked DSL, which would enable delivery of services such as VoIP by the end of September. Internet companies would be able to move their existing broadband customers to naked DSL from December. Enhancements to the service, which could open up opportunities for television and movies delivered over the Internet, would be likely 'over the next few years.'[50]

TALENT QUEST CONTINUES

New Zealand was not training and retaining the right kind of skills to achieve the economic and social gains envisaged by the government. Universities and technical institutions were losing skilled tutors and lecturers, students didn't seem interested in training as engineers, programmers, or network and ICT specialists. And even if there was an influx of interest, it was doubtful we could cope.

Employers were being warned to hold on to skilled staff by offering more attractive packages or risk losing them in a tightening labour market where there were huge skill shortages. While the unemployment rate was at a record low at 3.6 percent the number of job vacancies in ICT continued to climb. According to a 2006 Department of Labour survey, 118 out of 134 specialist IT areas were experiencing acute skills shortages, but the number of students enrolled for IT degrees fell a dramatic 44 percent in four years.[51]

HiGrowth Project director Garth Biggs had told the MIS Careers Fair in Wellington in November 2005 that New Zealand needed to triple its ICT workforce by 2012 if it hoped to meet government targets for the sector. The government wanted to raise ICT's contribution to the nation's GDP from 4.3 percent to 10 percent by 2012. That meant employing 125,000 people in ICT, up from only about 41,000 in 2005.[52]

IPENZ chief executive Dr Andrew Cleland voiced his concern following the 2007 Budget that the government hadn't taken into account the resources needed for its proposed investments in major infrastructure, which would require world-class engineers. Since 2000, he said, IPENZ had produced considerable evidence that the proportion of professional engineers in the tertiary-educated workforce was a critical success factor to resolving economic and environmental issues. New Zealand continued to have one of the lowest proportions of professional engineers in the OECD. The need to attract skilled migrants against strong global demand would continue to be critical for the nation.[53]

The skills issue was likely to be significantly heightened with projected growth in the industry over the next five years. More than 11,000 extra jobs and 300 new businesses would be created within New Zealand's information technology industry over the next four years, taking employment within the industry to 66,000, according to a Microsoft-funded study carried out by research firm IDC. It said spending on IT would reach $5.4 billion in 2007, and would then rise 4.3 percent a year till 2011.[54]

DOES NOT COMPUTE

Otago University computer science lecturer Simon McCallum, in his October 2006 paper 'Computer Science Shortage,' said there was likely to be a severe impact on the New Zealand economy unless the country addressed the 'sudden and dramatic drop' in the numbers of students enrolling in ICT degrees over the previous five years.

"This divergence in the supply and demand for programming staff raises a serious concern over the number of well-trained programmers that will be available for employment within New Zealand in the next five years. These trends are global and will impact on the New Zealand economy severely and limit growth," said McCallum. In the

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month he published his report there were 4203 IT jobs advertised on the two main employment web sites. A review of ten professions by the Department of Labour summarised the IT profession as: 'Genuine skill shortage.' The numbers suggested that New Zealand would have to compete with all its Western trading partners for the shrinking pool of skilled IT staff. Even in developing economies such as India and China there were reports of IT skills shortages.

McCallum's greater concern was the precipitous drop in enrolments for ICT degrees. In New Zealand, computer science and information science degrees had first-year enrolments less than 50 percent of those in 2001. The graduating class of 2004 was made up of first-year students mostly from the 2002–2001 year. The number of graduates in 2008 was expected to be fewer than half of the number in 2004.

The government did not appear to have taken this looming shortage into account with its plans to grow ICT revenues by 2012 to achieve 10 percent of GDP. To achieve those goals there needed to be 66,000 more staff in ICT companies, when the position at the end of 2006 was 22,000. By 2009 there would only be about 3500 ICT graduates. "Even if only one third of the employees have ICT qualifications this will only be an increase of 10,500 staff." Even including migration (around 200 per year) this would still mean only 33,000 employees.

"Given current enrolment numbers it would take until 2018 before we have enough graduates to get anywhere near this target. These numbers should be a call to arms for the IT sector. Industry and academia to work together to increase the numbers of students so there are qualified people to employ and sustain growth."[55] A report commissioned by the Game Developers Association stated that by 2010, the number of ICT professionals needed to increase threefold to take up expected demand. McCallum said regardless of any action taken, the industry would feel the pain through until 2009. He said some game developers were reconsidering whether to bid on contracts, and this impact would be felt throughout the wider ICT employment market as well.

HiGrowth executive director Garth Biggs said the findings validated long-held industry concerns that the industry had no mana.[56] "Kids are simply turned off. They don't see a future in ICT and think it's all about sitting in cubicles working on spreadsheets. Parents and teachers both seem uninterested and actively oppose children's interests in it."

The view was echoed by the associate head of industry and development at AUT, Tony Clear, who said even if there was an increase in the number of people wanting to take the courses the academic community most likely couldn't cope. As student rolls shrank, universities and polytechnics were offering redundancy to lecturers and reducing the number of staff teaching ICT. 'The ones who leave are, of course, the ones in greatest demand elsewhere, who can get a job in industry that typically pays very well.'[57]

ENGINEERING THE NET

If you took a survey of the movers and shakers involved in Internet-related decision making, bandwidth expansion or the use of academic and research networks to keep pace with international trends, the same faces kept popping up. They were often the same people who were labouring away on number eight

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wire solutions to connect our universities to the world back in the 1980s.

Internet entrepreneur Simon Riley was concerned at the lack of skilled people being trained in universities to cope with the next stage of the Internet's evolution, and the move to pervasive fibre-optic infrastructure. "The old grey beards back to Tuianet days are still driving things. Going forward, there is zero capacity of people with those kinds of networking skills in the university sector and very little funding for ICT at research level in this country. If you don't have funding you don't have courses or post graduate students or research activity. It's a lose-lose situation."

John Hine, head of the School of Mathematics and Computer Science at Victoria University, got involved in the Internet in the mid-1980s because he felt it could change things. "When TV and the Internet were new it wasn't a problem getting people involved. Now there's a tendency to take these things for granted. I guess that's why the same group got behind the country's research and education network. If you look at the roadmap for building capability for KAREN you'll also see there are quite a few challenges in that. We just have to keep trying to get people interested."

In August 2007 Hine took delivery of a substantial report from a working group of the US Government's NSF, detailing research challenges in advanced networking. It contained important information that would help New Zealand develop its own roadmap for the research community. So how many people in the country did he think could understand and accurately interpret such a report? He reckoned about a dozen people at university level including a couple within Crown Research Institute, Industrial Research. While the research wasn't necessarily where New Zealand should go, it was an indicator of how the country might follow behind United States developments. "We have to anticipate it and have a sense of the impact it might have on us."

Dean Pemberton, senior technical specialist and long-serving member of the (NZNOG, was also hopeful that more people would take a serious interest in network engineering. "If you look at the people starting to turn up to ISPANZ and InternetNZ meetings, many are in their 30s and have a good handle on where the Internet is going. It's taken us a while to get this generation of network engineers and computer science graduates involved. Now we need to make sure the new generation gets involved earlier."

Part of the problem, suggested Pemberton, is that young graduates often don't know about the opportunities. While a lot of new blood came up from the helpdesk environment at ISPs, many graduates were snapped up by large corporates before they had a chance to get exposed to the grass roots Internet. One of the attractive things about New Zealand was the size of the technical community. "It's small enough to meet the people you are dealing with. Having worked in Australia and the US, I know it's virtually impossible to get that kind of exposure because of the scale. However if you go to an InternetNZ or an NZNOG meeting you are going to find yourself face to face with the people who make the decisions."

NZNOG is a hugely influential group within the New Zealand technical community, mainly focused around discussing core issues and problems facing Internet and network development. At last count it comprised a discussion list of

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around 900 members, typically the chief network engineers at places like Orcon, Ihug, Iconz, and Vodafone. "You certainly wouldn't want to piss anyone off as your employment opportunities within New Zealand would go south rather quickly," said Pemberton. "The list is certainly a place to get a bit of experience, learn who the players are and get exposed to the hot topics and the way people think about them."

EXODUS ACCELERATES

Across the Tasman similar pains were being felt, with the ICT sector hit hardest by the talent crisis and skill shortage. The Deloitte Technology Fast 500 CEO survey suggested the problem was complicated with the baby boomer generation reaching retirement age. Deloitte Technology media and telecommunications (TMT) industry group leader, Damien Tampling, said CEOs were citing chronic shortages of talent as one of their greatest concerns, with fears the problem could go on for decades. Technology companies in particular would suffer from this global problem as they sought to innovate and expand. All companies surveyed agreed the biggest challenge was finding, hiring, and retaining qualified employees. CEOs had made talent their top personal challenge in a bid to develop the next generation of leaders.

Tampling said a large number expressed concern about the focus of national education systems failing to train people with skills for modern market requirements which had a drastic effect on 'offshoring' or importing required talent. The survey of the fastest-growing tech companies in the world found that 75 percent of CEOs in Australia and New Zealand listed talent shortages as one of the most serious items on their agenda, especially among those working in ICT where it was even more acute.

Deloitte's head of IT infrastructure, Chris Mills-Vasas, believed the way managers saw people and their value to the organisation needed to change dramatically. "We encourage everyone to undertake development plans, regularly review and support people and offer variety in roles … As we give value to each role and make them more interesting we attract talented people and keep them longer."[58]

Meanwhile the Department of Labour's 'Skills in the Labour Market' report, covering the June 2007 quarter, showed the working-age population grew only 0.2 percent, the lowest quarterly result for nearly two years. Combined with falling net migration that meant employers had a smaller pool of talent available. "The labour market has been showing this trend for some time and employers know they need to think outside the square when it comes to recruiting … They need to consider retraining and upskilling existing staff before looking for new people, and offering attractive terms of employment," said Labour Department deputy secretary for work directions, Monique Dawson.

Job vacancies had rocketed in Canterbury and other parts of the South Island, although there had been a decline in job opportunities in Auckland and Wellington, leaving the overall market flat. However the Labour Department report said overall there was an increase in openings for highly skilled occupations, with firms having difficulty attracting skilled staff – up to 42 percent from 41 percent in the March 2007 quarter.[59]

Figures on long-term and permanent departures gave further

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reason to consider the impact on the job market, with a steady exodus of some of our brightest people, who didn't believe there were sufficient opportunities for growth or rewards for their skills within New Zealand.

For the first time, Kiwis were the largest immigrant group to Australia, with the numbers crossing the Tasman to settle permanently rising almost 5000 to 23,906, in the year till 30 June, a 26 percent increase. In other words there were more New Zealanders than British heading to Australia, the majority of them going to Queensland, followed by New South Wales. The Australian government's immigration policy favoured skilled people with qualification ranging from nursing to medical specialists and welders.[60] New Zealand's high business and personal tax rates compared to Australia's rapidly declining toll on incomes was seen as a major incentive for jumping the ditch.

National Party immigration spokesman Lockwood Smith said the biggest worry was that almost 80 percent of those leaving New Zealand were under 40 years of age. "We are losing too many of our best and brightest overseas. Simply covering our net loss to Australia takes all the immigrants New Zealand gets from the top ten sources of migrants combined, including the United Kingdom, the Philippines, and India. Kiwis are voting with their feet … and are making their homes and their futures elsewhere."[61]

INVESTMENT FAILURE FINGERED

Plans for huge, multi-billion dollar investments to revolutionise 'Australia's Internet infrastructure' were made by both major parties ahead of the 2007 elections which ushered in a new government. John Howard's Liberal-National coalition was ousted by Kevin Rudd's Labour Party in November, which promised a 21st-century high-speed broadband infrastructure and even appointed a minister for broadband. New Zealand's Opposition leader John Key said the National Party was unlikely to follow suit and spend taxpayers' money on building broadband infrastructure. It would not want to be locked into any particular delivery mechanism for broadband and preferred subsidies rather than direct investment.

However Key conceded broadband access was a major issue, ranked only behind the cost of housing with the public. He referred to problems in his own constituency, in the Kumeu area north of Auckland, where quality of service issues were having an impact on business and the economy.[62] Meanwhile Pt Chevalier residents felt they were being short-changed after a public meeting with Telecom failed to resolve their broadband problem. More than 100 residents signed an on-line petition complaining about poor Internet speeds and connections. Some parts of the suburb had not been able to get the technology at all. About 80 residents met with Auckland mayor Dick Hubbard[63] and Telecom representatives at Pt Chevalier School.

Hubbard said broadband was an important utility in the modern world, not just an optional add-on. "People are working from home, more students are moving into the area, people are reading more news on-line instead of buying newspapers. People may think that three months out from an election there is a temptation for politicians to use bolder statements but it's absolutely unacceptable. I can understand with rural areas it may not work but Pt Chev is six or seven minutes from the CBD. For a city such as Auckland not to have broadband … do accuse Telecom," said Hubbard. Telecom admitted there were problems; possibly it was the length of copper loop from

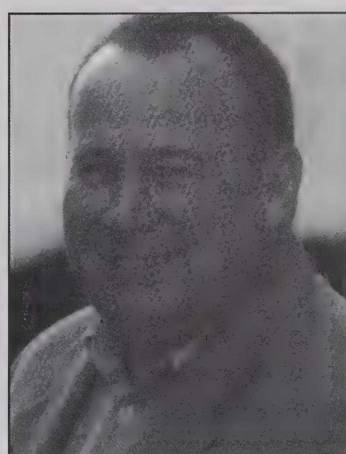
the Mt Albert exchange to Pt Chevalier and while it planned to install local loops through fibre-fed containers it had to wait for government consents. That $2 million job would probably start in December, said a Telecom spokesman. The noisy meeting wasn't deterred by that explanation with comments such as "It's unacceptable" and "Do it now," echoing around the school hall.[64]

When the OECD Communications Outlook figures came out in July, the finger again pointed at New Zealand as having been greedy with profit and stingy with investment. According to the OECD, telecommunications revenue in New Zealand was 5.39 percent of GDP, the highest of any of the 30 OECD countries where the average was around 3 percent. "Telecom New Zealand is among the world's most profitable telecommunications companies, with its dividend having traditionally been around four times the industry average."

These facts showed that the industry in New Zealand was anything but struggling, said TUANZ chief Ernie Newman. He reiterated his earlier observations that New Zealand had continued to under-invest in critical infrastructure. "It is no wonder our telecommunications infrastructure is creaking at the seams and New Zealanders are being denied the basic services required to be full participants in a modern-day economy … Given that major investments have been made in mobile services over recent years, it is clear that the big difference is in the failure to maintain appropriate reinvestment levels for fixed-line services."[65]

New Zealand's telecommunications investment as a percentage of the industry's revenue was 32 percent between 1988 and 1990 when Telecom was privatised, but had fallen to 17 percent by 2000 and was 8.7 percent in 2005. Only Greece and Austria invested less that year. The OECD average was 15.3 percent. However Telecom said the situation had improved. Spokesman Mark Watts said capital expenditure in the year to 30 June 2006 was $620 million or 9.3 percent of revenue. Capital expenditure was forecast at $683 million for the year to June 2007, including upgrading its copper-line network for faster broadband speeds. Telecom's annual reports, however, showed capital expenditure had fallen from $1.5 billion in 2001.

TelstraClear's head of corporate services Mathew Bolland said it had not had the opportunity to invest. "If you have to throw a serious amount of money at a market where you've got a competitor that can block you ... [when] we don't have unbundling yet, is it any surprise?" TelstraClear spent $141 million in New Zealand in 2006 but pulled back from its major investment in establishing a third mobile network. Vodafone's general manager of corporate affairs Tom Chignell said so far the company had spent $2 billion, which included the initial purchase of BellSouth, buying Internet company Ihug for $41 million and upgrading its mobile network. "We've always invested heavily in the mobile sector and now … we'll be investing in the fixed-line sector as well."



Mark Ratcliffe, Telecom's chief information officer.

New Zealand had also been a laggard when it came to research and development in communications. Telecom, the 39th biggest telco in the OECD, spent just $9 million on research and development, or 0.2 percent of revenue, in 2005. Most of the big telcos spent well over 1 percent of revenue on R&D and some had to meet legislated minimum standards; British Telecom for example spent 3.7 percent. Telecom said it expected to spend slightly more than $9 million in the 2007–2008 year.[66]

Telecom's NGN project, underway since 2001, when the original outsourcing deal was signed with Alcatel (now

Alcatel-Lucent), had largely been a behind-closed-doors affair in terms of upgrades to the core and edge IPNetworks, major transport layers, and extension of fibre beyond the exchanges. Core NGN services had been available to corporate customers for some time, but the big daddy was the mass market move of voice services from the PSTN. Telecom chief operating officer for technology and enterprises Mark Ratcliffe said there was a $205 million budget to migrate the old PSTN network, and when it did Telecom would be one of the first incumbent service providers in the world to do so. The process was expected to begin towards the end of 2008, after consumer and voice service trials.

The transition was in fact rather more urgent than Telecom made out. The remaining ancient NEC NEAX exchanges – which Telecom admitted were tired and needed replacing in 1997 and again in 2000 – were operating at or above full capacity and were a weak link in the network. This became apparent during 2007 when several failures again pointed to lack of investment. Ongoing maintenance and access to spare parts was becoming an expensive exercise for the end-of-line technology.[67]

RELIEF FOR RURAL ROUTES

KIWI SHARE HOLDS FAST

All New Zealanders, including those in rural and outlying areas and those termed 'non-viable' by Telecom under the Kiwi Share arrangement, were likely to be given a legal right to broadband under proposals put to Cabinet by the end of 2007.

All New Zealanders, including those in rural and outlying areas and those termed 'non-viable' by Telecom under the Kiwi Share arrangement, were likely to be given a legal right to broadband under proposals put to Cabinet by the end of 2007.

David Cunliffe said there was still a great deal of disquiet from the rural sector about the state of the network and it was essential farmers had access to the same high-speed, high-capacity broadband available to urban business and residential users.

"Quite clearly there has been a history of under-investment in rural telecommunications and we want to see that turned around. The more I learn, the very much more serious I am coming to believe the problem is." The government was investigating rural phone and Internet services and a proposal to substantially revamp the TSO, otherwise known as the Kiwi Share, in parallel with its Rural Broadband Strategy aimed at ensuring acceptable access.[68]

"The cost to Telecom of providing this is cross-subsidised by other members of the industry to the tune of about $20 million net a year. We are going to have to take a very hard look at whether a non-contestable cross-subsidy of that nature fits with the emerging evidence on the level of investment, or lack of it, in rural networks." Proper incentives were needed for market participants to lift their investment and service levels to rural New Zealand, said Cunliffe.[69]

BROADBAND KIWI SHARE?

The Kiwi Share was first established when Telecom was privatised in 1990, guaranteeing free local calling to all regions at the same cost with no increases beyond normal inflation based on the consumer price index. It was later agreed the arrangement extended to the

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Internet, with rural customers promised a minimum of 14.4kbit/sec access. Now Cunliffe was looking to clarify whether the TSO should cover rural broadband access. If anything the rules would be tightened rather than relaxed to ensure New Zealanders had access to affordable basic telephone services, he said. "We have no intention of moving away from the basic principle in the Kiwi Share of preserving free local calling for residential telephone users."[70]

In February Telecom began talking about recycling the first generation ADSL broadband hardware from exchanges around the country to supply regional areas. It was spending $50 million–$60 million upgrading 120 exchanges in 2007 to deliver faster DSL2+ technology. The old technology would be used to provide broadband to areas where the service was not currently available. However some were less than impressed with the idea. "You would wonder why you would put old gear in," said Don Nicolson, Federated Farmers' vice president and telecommunications spokesman. "If it is no longer useful in a built-up area, putting it into a rural area – when technology is changing so quickly – looks like a retrograde step." He said it would be disappointing if rural New Zealand continued to get second best.[71]

The Commerce Commission decides annually the cost incurred by Telecom in delivering services to outlying and rural areas. Telecom's compliance cost for the 2003–2004 year was $63.8 million,[72] 70 percent of which it had to cover itself. The balance was shared by Vodafone, TelstraClear and other carriers including WorldxChange, CallPlus, Compass Communications, Teamtalk, and Ihug in proportion to their 'net liable revenues.' When those bills go out there's always a backlash, with the various players wondering why they should be subsidising Telecom's loss-making customers.

For the amount they paid some carriers wanted an opportunity to reach those customers themselves, but that's not how the TSO is structured, although the findings of the review could well change that. WorldxChange director Paul Clarkin was calling for an end to the TSO. "Its relevance is well past its use-by date, especially when we talk about naked DSL and LLU." Looking ahead he said it was important the TSO recognised the range of new services, rather than a system where the more new customers a challenger signs up, the more they get penalised. Vodafone commercial development manager Tom Chignell was also 'extremely concerned' at the cost increase from the revised draft determination, calling it 'a tax on competition.'[73]

Vodafone claimed the current system penalised Telecom's competitors, took no account of alternative access networks and was potentially limiting investment. If another carrier were to win customers away from Telecom in these non-viable areas, they would be charged more through the TSO subsidy while Telecom's costs would remain the same and it could claim back more through the TSO. Vodafone head of government relations Roger Ellis wanted to know where these non-viable customers were, so infrastructure providers could make commercial decisions around network build, to potentially accommodate them. This would reduce non-viable customers, which could then be more effectively tackled co-operatively between government and industry. "We're saying the TSO would

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roll back to areas where there is no competition," said Ellis.[74]

CARRIERS HIT TWICE

The Commerce Commission announced its draft TSO determinations for the 2004 to 2006 period on 9 July, stating the net cost to Telecom was $71.4 million between 2004 and 2005, and $78.3 million from 2005 to 2006. Telecom would bear 69 percent while the bulk of the remainder would be carried out by Vodafone and TelstraClear. According to TUANZ's calculations, Vodafone and TelstraClear would be asked to pay Telecom $66,501 every day to subsidise Telecom's supply of services to customers that can not be served profitably over its fixed network. TUANZ chief Ernie Newman said carriers were being hit twice under the scheme. "They cannot compete to service these customers because Telecom gets a subsidy and they don't. Then, to add insult to injury, they have to contribute to the subsidy." This, he said, stifled innovation and investment in other technologies because fixed lines, and therefore only Telecom, qualified for the subsidy. This was a sign the government needed to speed up its TSO review, which was taking too long.[75]

Meanwhile Telecom had hinted in August that it would seek to charge higher line rentals outside the main centres if the Commerce Commission pressed ahead with its plan to "de-average" local loop pricing. However David Cunliffe said it wouldn't be allowed to raise its phone line rentals to small towns and rural areas beyond the rate of inflation. The TSO agreement between Telecom and the Crown prevented this. "Telecom is allowed to charge less than the standard rate in any area if it wishes, but it cannot increase the rates in other areas to compensate."

Commerce Commission telecommunications director Osmond Borthwick said variations in the LLU price might flow through to different line rental charges, which might leave some room for differences in charging for broadband-only lines or naked DSL in urban and rural areas. That might include the 335,464 homes or 27.2 percent of households that lived outside those areas. After deducting the cost of accessing the local loop from its current line charges, Telecom's wholesale and retail businesses would be left with a margin of $11.40 that would need to more than cover the cost of providing rural backhaul, equipment to provide free local calls, a basic dial-up Internet service, and marketing and billing costs. There did appear to be some room for Telecom to raise its line rental charge by more than the rate of inflation if it could show the profitability of its fixed-line business "is being or will be unreasonably impaired" by its deal with the Crown, said Borthwick.[76]

When the government's discussion document to canvas ways forward for the TSO was finally released in August, one of the recommendations was to make services in the difficult areas contestable. It said about half of the telephone lines in rural areas were broadband capable compared to 98 percent of urban lines. Ernie Newman said the existing system where telecommunications companies contributed to Telecom's provision of services in those areas made little sense. "It's bizarre that service providers other than Telecom, who actually have a service available ready to switch on for those same customers, are not only deprived of doing that on a commercially viable basis, but have to

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subsidise Telecom for its non-viable service." He cited Vodafone, Kordia and Woosh as having potentially suitable networks.[77]

The government hoped to improve the chances of widespread broadband when it offered local radio spectrum licences at tender, which could be used for broadband coverage. It made available 75 area spectrum licences during the last quarter of 2007 for wireless access services in the 3.5GHz band. This followed the sale in 2006 of an initial 73 licences, targeted mainly at larger provincial centres and metropolitan areas.

Another issue that would inevitably impact on the rural community was the first ruling of newly appointed Telecommunications Commissioner Ross Patterson, in announcing what came to be known as de-averaged LLU pricing, setting a higher price for access to lines in the rural sector and lower-than-expected prices for urban areas. Telecom's retail arm and other telcos could access Telecom's copper phones lines at $16.49 a month in the main centres and $32.20 elsewhere, including rural areas. The question remained whether they would still have to pay Telecom for a share in the cost of extending its network to many of these so-called 'loss-making' customers through their Kiwi Share obligation.

Telecom warned, however, the 'de-averaged' LLU price mixed with 'an averaged unbundled price' would have dire consequences not only for itself but for end users. Telecom Wholesale general manager Matt Crockett said he understood the Commerce Commission's reasons for doing what it did but it left him feeling "very exposed as a wholesaler." Overall uncertainty about the TSO outcome and other regulatory decisions on the way could leave Telecom stuck with 'a very challenging model.'

Price differentiation, Crockett suggested, could mean rural New Zealanders ended up staying with an averaged unbundled bitstream access (UBA or naked DSL) product with little incentive to change. There might also be difficulties and costs involved in marketing different packages to different groups based on location. There was a consensus that broadband in rural areas would stay with UBA, but with a de-averaged LLU price Telecom would 'bleed money everywhere.' There was also debate as to what exchanges would be classified as rural and which would come under the urban classification. Telecom hadn't determined this. The Commerce Commission suggested that alternative technologies such as wireless technologies should increase in popularity and therefore create alternatives for rural access seekers or ISPs.[78]

Matt Freeman's blog on the subject quipped, in relation to Telecom's alleged difficulties about marketing different bundles to different regions, "They seem to have no problem doing this with their retail business in Christchurch and Wellington for residential line rentals, where there is competition from TelstraClear." Submissions on the TSO were extended by a month with no announcement expected by the government until at least the end of 2008.

UNBUNDLING FIBRE LOOP?

Telecom continued to roll out higher speed DSL2+ broadband over copper to customers in the main cities, and move its cabinets closer to the streets to shorten the copper loop in the more fortunate suburbs. Greg Patchell, Telecom group technology officer, said installing smaller, more flexible DSL2+ DSLAMs marked a shift in protocol from the older ATM-based technology to Ethernet, which was able to better handle multiple gigabits in the backhaul.

The Alcatel IASAM boxes more easily interfaced with Telecom's Next Generation Network Multi-protocol label switching (MPLS) backbone and even used Ethernet cards, to deliver 100Mbit/sec dedicated lines into business premises. Meanwhile older DSLAMs were being redeployed to lower density areas to help bolster bandwidth there.

Outside of massive multimedia or business use, Patchell said the industry seemed to have a preoccupation with speed which, he said, would 'come along by default' over time. "With cabinetisation kicking in across older suburbs you'll start to see uniformity of experience and that'll make a difference. The headline speeds are not relevant to most consumers. North of 3Mbit/sec is ideal for MPEG2 level broadcast transmission or downloading TV programmes; any more than 4Mbit/sec won't make any difference." He expected the Digital Strategy benchmark of 5Mbit/sec to 90 percent of the population by 2010 would be increased in the 2008 review, possibly reflecting geography which was clearly being kept in mind with the different prices for urban versus non-urban pricing of DSL access fees. "It's expensive to reach four customers 35 miles from anywhere."

Patchell believed public-private and community partnerships were likely to be the only way many outlying areas would get the kind of coverage being talked about. "We've worked with partnerships along the west coast of the South Island and it has worked there. Auckland, Wellington, Hamilton, Christchurch will all be well serviced but you're always going to see geographical distortion. LLU competitors are not going to put DSLAMs in Gore, they'll put them in Auckland. The conversation is always going to be geographically bounded because of the nature of the country."

Genuine progress was being made but the government, local authorities and the community needed to be involved in the broader roll-out. "It's always going to be a challenge to write a business case for remote New Zealand when you've got shareholders. The role of public authorities is to work out how to deal with this social separation. Incentives will be needed and that may be as simple as absolute certainty about pricing and regulation."

The next step up, and Patchell was cautious not to hype the capability, was very fast VDSL,[79] technically all Ethernet up to and including the exchange, DSLAM and cards. The downside was that this ramped up the way voice and data packets were handled by another frequency notch, meaning it was only effective over distances of less than onekm. It was also highly sensitive to mismatched lengths, although with a uniform network in a new suburb performance would rocket ahead, possibly between 50Mbit/sec and 100Mbit/sec. However there were no local deployments and the business case was still being worked through.

Of course building fibre to the home or business presented not only technical and logistical issues but regulatory ones. While LLU arrangements remained regardless of whether the access network was copper, fibre or wireless, there were issues with 'regulated broadband' which only related to copper. Whether fibre-to-the-home (FTTH) networks would be wholesaled in the same way as the copper network was being discussed as part of the LLU reforms. Regulation might ultimately be expanded to cover this area, although it was likely to become an industry issue. A case in point was Pegasus Town near Christchurch, where TelstraClear won a contract to put in fibre and was refusing interconnection with other carriers. While Telecom was required to share its local loop networks with competitors there was no requirement for its competitors to reciprocate.

TelstraClear had won the sole provider deal to service residents and businesses in the 340-hectare, greenfields township being built at North Canterbury's Pegasus Bay in March. The billion-dollar project being constructed over seven years would be home to 2000 residential and commercial lots, housing around 5000 people. TelstraClear would provide Pegasus consumers with InHome triple play, including premises and boundary cabling, pay TV, and set top box, 10Mbit/sec broadband Internet, and a phone line package, including a dedicated contact centre service and a unique phone number range, for a one-off connection fee.[80]

While Telecom had been known to collaborate with TelstraClear, for example, sharing fibres over a conduit between Queenstown and Invercargill, there was a concern that when it came to accessing fibre-cabled suburbs there might be competitive lockout. "That's the big unanswered question. It should be a whole-of-industry concern." So how would Telecom handle it if TelstraClear asked for access to fibre-to-the-premises suburbs it had cabled? "While this is not a formal stance, I would be fairly confident we would offer a wholesale arrangement or at least be prepared to talk about it. If Telecom was to make a decision like TelstraClear has made in Pegasus Town, I don't think we'd get away with it, we'd just get another hammering," said Patchell.

An example of what might lie ahead came when WorldxChange struck a deal to run its services over a Telecom open access fibre pilot at ten new subdivisions. About 1000 residents in Wanaka, Queenstown, Papakura, Cromwell, and Orewa would have a choice of running with WorldxChange's Xnet VFX digital voice over broadband service from February to September 2008. Telecom Wholesale CEO Matt Crockett said the company was "committed to providing open access" to its networks.[81]

PAYING FOR THE PRIVILEGE

While there had been a lot of noise about what different providers would do once they had better wholesale prices or unbundled or naked DSL access, the missing piece to the equation was still the economics: how much would they have to pay Telecom? Everyone had been waiting for the Commerce Commission to announce that small but significant detail. The Commission had been taken to task previously for determinations that erred on the favourable side for Telecom. Ihug and CallPlus took it to the High Court in 2006, claiming the wholesale charge was too close to Xtra's retail pricing. They withdrew their action in December after it agreed to review its methodology.

The Commerce Commission's first attempt at establishing prices was $26 for a wholesale DSL connection versus $29.95 for the retail offering to Telecom end customers. ISPs were up in arms claiming this would rapidly see them bleeding their customers to Telecom. Despite pleas from the industry for a better deal it made only a minor adjustment to the monthly charge. Frustration deepened.

Another attempt saw the charge for a wholesale broadband connection fall from $27.55 a month to $26.35 a month (ex GST). Ihug and CallPlus had been seriously hoping for a figure closer to $20.74. Regardless, the ruling was backdated to October, so the ISPs would receive about $1 million in refunds. After more than nine months, the Commerce Commission's pricing methodology, complained Ihug CEO Mark Rushworth, "does nothing to drive competition." The announcement was way off the mark. "With a 27 cent margin, I see no profitability in broadband ... we are destined to be in the backblocks for sometime."[82] CallPlus chief executive Martin Wylie said, "It is a little disappointing, but any savings help when you are in a price squeeze."[83]

Then draft determinations for LLU and co-location services were released, enabling ISPs and new carriers to begin finalising investment plans. "The LLU price of $16.49 per line in urban areas is competitive, and provides a good incentive to ISPs to invest in DSLAM infrastructure in the urban areas, however, the rural LLU price of $32.20 per line is high, and reinforces the need for the

government to come to the table with its oft-mentioned rural broadband package," said InternetNZ executive director Keith Davidson.[84]

As expected much of the initial focus was on getting into the cities and built-up areas as quickly as possible, with the occasional nod to possible wireless solutions for the rural heartland. IDC analyst Darian Bird said there were still a lot of details to look at, and plenty of hidden costs not covered in the $16.49 a month that Telecom would charge access seekers. Ihug's Rushworth said the urban access price was at the right end of the scale and would help the company decide where it would build networks, instead of continuing to buy wholesale broadband from Telecom. "The key message the Commerce Commission is sending is that it wants network-based investment to be the driver of competition." A final decision on pricing was to be ratified in December.

Orcon chief executive Scott Bartlett thought the price was at the higher end of the company's expectations but he was cautiously optimistic. "It certainly enabled us to go out and invest heavily in the urban areas for broadband." Orcon planned to invest well over $200 million and had spent $1.5 million on equipment for testing LLU. "I can go to our board and our shareholders and say, 'This is an investment that makes sense.' It's enough certainty for us to move into the next phase." Martin Wylie of CallPlus said differing prices for rural and urban access gave the company an investment case for offering WiMax wireless broadband to rural customers. TelstraClear saw the decision as the first step towards introducing the services it offered in Wellington and Christchurch to other parts of the country.[85]

In the second week of August 2007 the first tentative steps in the unbundling bonanza began. Telecom opened access to telephone exchanges in Ponsonby and Glenfield, allowing competitors to plug their equipment directly into its copper phone network. Orcon and Ihug were in like a rat up the proverbial drainpipe. Ihug's Rushworth said it reminded him of getting the keys to his dad's Cortina when he was 16. "That was a big occasion … It's the same kind of situation here in a sense – a significant milestone. What we're excited about is we can control the end-to-end service and that's critical, particularly with broadband." However he was concerned the Commission only required Telecom to unbundle 15 exchanges a quarter. "It needs to be double, triple that," he said.

Orcon would be locating broadband equipment in every open exchange. "Orcon, with the backing of Kordia, has made a commitment on a nationwide launch, which means we intend being in most towns," said Bartlett. "Anyone not covered will be covered by our wireless 'Extend' service." Orcon planned to offer high-speed broadband – up to 100Mbit/sec – and even deliver high-definition video services. CallPlus was also testing equipment in two of the exchanges with a full commercial service expected to be launched by the end of the year.[86]

Kordia borrowed an extra $38 million in late 2007 to help finance its bid to take on Telecom and Vodafone and become a major telecommunications provider. It had agreed to pump a 'substantial' amount of fresh capital into Orcon, so that it could take advantage of LLU and install Internet access equipment in every Telecom exchange that it could access. Orcon expected to launch its own mobile service, using Vodafone's network, in February. But some of the money would help finance the construction of Kordia's digital terrestrial television network and an overdue upgrade of its management information systems.[87]

Among the rush of press releases, in the clamour to be first to LLU, was one from TelstraClear, smugly entitled 'Please be careful – we're already in there,' reminding enthusiastic interlopers that it already had equipment in 17 Telecom exchanges. TelstraClear head of corporate services Mathew Bolland warned that "in the rush to do what TelstraClear has already done" there was a chance they might bump into the precision hardware the company already had up and running. "We can remember how exciting it was when we first interconnected with Telecom over a decade ago and when we installed unbundled partial circuits last year it was a moment to treasure."[88]

NETWORK A NOTWORK

Then at the end of August 2007 a 'hardware fault' with NEAX phone switches serving the North Shore and Papatoetoe exchanges caused major disruption, affecting tens of thousands of calls to cellphones, freephone numbers and overseas numbers. The fault lasted two hours and was compounded by network congestion.

The MED warned such outages could become increasingly common, as aging equipment in Telecom exchanges became harder to repair. It said Telecom might not be able to guarantee that 200 NEAX phone switches supplied by Japanese firm NEC could perform to 'international norms' before they were replaced. Some of the switching equipment was 40 years old and NEC was no longer making some spare parts. Telecom signed a $200 million contract with Alcatel in 2005 to completely replace its aging switched network with a next generation IP–based network, but that was unlikely to be completed until 2012 at the earliest and some switches might not be replaced until 2015, said the Ministry.

Telecom spokesman Mark Watts, however, insisted the switching equipment was performing satisfactorily, was robust, part of a stable network architecture, and maintained to a high standard. "We have the capacity to repair all of the NEAX equipment across our network." It would continue 'cannibalising' equipment and reusing parts while the network was being replaced.[89]

While glad to have taken the first step, alternative carriers were urging Telecom to move quicker. Telecom had originally proposed to open up ten exchanges every three months but the Commerce Commission had boosted that to 15 and even that wasn't quick enough for the eager new entrants. In submissions on the draft unbundling determination Ihug had asking for 25–30 exchanges and at least 100 urban exchanges in the first year of unbundling. TelstraClear wanted clarification that it could complete its own installations if Telecom didn't have access ready within the required 20-day period, or if it failed to roll out the minimum 15 per quarter.[90]

Then within weeks Telecom admitted the deadlines imposed by the Commerce Commission for the opening-up of the first batch of exchanges were too ambitious, suggesting only five of the first 15 exchanges required would be ready in the specified period. It claimed the list of priority exchanges required complex and lengthy preparation work. Telecom project manager Alan Mitford-Taylor said the first exchanges to be opened – Ponsonby, Glenfield, Ellerslie, Mt Albert, and Browns Bay – were the easiest to prepare and the next ten would be more complicated. Technically Telecom didn't have to comply until after the final determination was issued in November and was suggesting competitors target simpler exchanges to make life easier. A shortage of materials and technicians might also present a problem. For those exchanges needing extensions to fit competitors' equipment, building consents could further complicate things.[91]

Then came more of the devilish details the industry had been warned about. After all the hoopla Orcon announced it wouldn't be delivering its naked DSL as planned, citing the "crippling limitations" Telecom had placed on the wholesale product. Orcon retail general manager Larrie Moore refuted claimed that his company simply didn't have its product ready for market, saying the "caveats" Telecom proposed had forced it to put its product on ice. He said, Telecom was only allowing it to deliver its voice over IP product to 50 customers per week, with a maximum of five to ten per provider.

Moore claimed he had to turn business away. "We're not going to market with a handful of connections ... what's the point of launching a product that we can only sign up one or two customers a day?" He claimed this was an attempt by Telecom to limit the impact of lost line rental and calling revenue as customers switched services.[92] Slingshot and WorldxChange had released their VoIP product using naked DSL, however, Orcon would keep its customers on hold until it could work out a better deal.

The details of the government's proposed three-way operational split of Telecom were finally

announced at the end of September with few adjustments to the original April plan. The three business units included a stand-alone network access unit, and one or more arm's-length wholesale units and business units that might include retail. After Telecom's draft plan separation had been considered by the Commerce Commission, it would become legally enforceable no later than 31 March 2008.

InternetNZ executive director Keith Davidson said this was another important milestone in the levelling of the playing field for the telecommunications industry. "The government is to be congratulated for its bold move to proceed with the operational separation plan largely as originally envisaged which provides the correct incentives for the future."[93]

The 70-odd page document outlining operational separation meant the three different units under the Telecom umbrella would be strictly physically separated, and communications between the departments would be closely watched by the newly formed IOG as a watch dog. Incentives for staff would not be based on Telecom's overall performance, and remuneration within the wholesale unit, for example, must not compromise any direct or indirect incentives linked to Telecom's overall performance. The network unit would have to have a different brand to Telecom and would not be allowed to appear with Telecom's brand. If Telecom failed to comply with the government's undertakings, the carrier could face penalties of up to $10 million for each breach and a $500,000 per day penalty if the breaches continue.[94]

WORKABLE CHALLENGE

Outgoing chief financial officer Marko Bogoievski had campaigned hard for Telecom to be allowed to sell its network arm and for a less complex form of operational separation of its wholesale and retail arms, without duplicate administration. He had complained strict three-way operational separation would "suffocate" the company and stall investment in telecommunications infrastructure.[95] Now, Mark Ratcliffe, Telecom's chief operating officer for technology and enterprises, said work on operational separation was well advanced. "Our initial assessment of the determination indicates that it represents a demanding multi-year programme of significant change for Telecom and the industry ... With respect to the demands they will place on our people, the requirements are challenging though workable."

Everyone at Telecom was working to tight deadlines on a range of projects including unbundling broadband. "We will continue to make it clear to both the Commerce Commission and the government that Telecom's delivery of new regulated broadband services, and our meeting of the required milestones for operational separation, present real physical challenges." He reiterated[96] that compliance with operational separation was likely to cost Telecom around $200 million in capital expenditure over the next four years, with operational costs of up to $40 million per annum over this same period.

Telecom had already broken out a wholesale unit, run independently from the retail units for most of 2007.[97] There were also widespread rumours the physical fixed line network under the Access Network Services (ANS) unit; valued by Citigroup at between $3.5 and $4.7 billion, was for sale.

Incoming Telecom CEO Dr Paul Reynolds received regular briefings from his colleagues on the operational separation process, and made his views known to the government.[98] In announcing Telecom's annual results, chairman Wayne Boyd told shareholders the company was entering a new era, symbolised by the new regulatory landscape and Reynolds' arrival.

Telecom revenues for the year were just over $3 billion, after-tax profits were $955 million up 16.5 percent on the $820 million it posted in 2006. Revenues were boosted by the one-off gain of selling the Yellow Pages Group for $2.84 billion. Total DSL connections including residential,

business, and wholesale were up 40.4 percent for the year to June at 653,000. Total DSL connections – including residential, business, and wholesale and mobile broadband – were 653,000, an increase of 40.4 percent. Broadband and Internet wholesale revenue was $49 million, an increase of 44 percent. As at June 2007 Telecom had 165,000 broadband wholesale connections. Its capital expenditure was up 12.4 percent to $844 million and it forecast spending of $950 million to $975 million for the 2007-2008 year.[99]

According to IDC Research, Telecom had migrated 605,000 or 71 percent of its Xtra customers to broadband by the end of June, with 238,000 left on dial-up. Competitors, operating on slim margins reselling Telecom's services, had shifted only 19 percent or 120,000 of their customers to fast Internet, with 502,000 still on dial-up. Everyone was waiting for full unbundling before the mass migration.

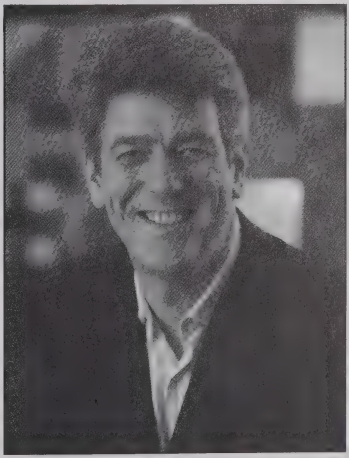
THE NETWORK STAYS

Then Telecom's new boss chipped in. His first public statement in October 2007 was to dispel rumours that Telecom was about to sell off its core network. Following Telecom's annual meeting in Dunedin he affirmed that Telecom was 'fundamentally a communications business' founded on running a network and there were no plans to change that.

"I think the outcome in David Cunliffe's determination was good … for customers, it's good for New Zealanders and … for Telecom and that's because for customers it paves the way for choice ... I think it sets a clear framework for firms to invest – that's Telecom and other service providers in the market – and it's good for Telecom because it enables us to have real certainty about our market, to focus and to get on with growing our business, whether that be in the retail, the wholesale or the access space."

Broadband brought a wealth of opportunity and possibility that hadn't yet been fully exploited. "There's also some opportunities to grow in new markets and we see some real strengthening in our capability in Australia, for example." The new environment was going to be time consuming and would result in changes right across the company, said Reynolds.[100]

He told the annual meeting that the separation would give the management of each division the ability to focus on a distinct set of customers. Evidence from his British Telecom experience was that the retail business could be more innovative with new products and services. Without an over-dependence on the network unit, the wholesale unit was able to build trust with its customers and increasingly operate networks on behalf of those customers. The access network operation had become the foundation for good customer service across the market by focusing on fast provisioning and repair. "There's a lot of fears around the process … but what we found was that all three parts of the business began to grow," said Reynolds.[101]



Paul Reynolds, new Telecom CEO took up his role from Theresa Gattung in late 2007 fresh from helping British Telecom cope with structural separation.

As Reynolds stepped up to his role the Consumers' Institute said one of his more urgent tasks would be to try to rebuild consumer confidence in the Telecom brand. The institute had received an unprecedented flood of angry complaints claiming Telecom's brand had received lasting and significant damage. President Suzanne Chetwin said the

company's public image had taken a battering in the past two years, reaching a new low during the troubled launch of Yahoo!Xtra Bubble in August, which was the last straw for many customers. She predicted Telecom would lose a significant number of customers, particularly as competitors got access to the Telecom local loop.[102]

A PricewaterhouseCoopers report[103] released on 2 November revealed businesses were worried about the cost and continuity of broadband and telecommunications services and the impact this might have on their future viability. Continued supply of broadband was a 'major worry' for 15 percent of companies surveyed, while telecommunications supply greatly worried 13 percent; 14 percent were seriously worried about broadband costs and 16 percent about telecommunications costs. "Both are top-of-the-mind infrastructure-related issues with the impending separation of Telecom," said PWC.[104]

Within two days of the report a scheduled weekly switch over from mains supply to back-up supply at Telecom's central Auckland Mayoral Drive exchange failed. The routine Sunday test of the UPS system worked for half and hour then crashed. Telecom tried to get the mains power back-up but the IT systems were also down, along with its IVR and customer database, further complicating matters. Phone calls were unaffected.

Epitiro managing director Mike Cranna was stunned a shutdown should have occurred at such a critical data centre where there should be 100 percent redundancy. The failure caused a significant bottleneck for all the nation's ISPs for about an hour.[105] Auckland's emergency services communications centres were affected and South Island police and fire communication centres had to switch to manual during the breakdown – in other words, pen, and paper. The outage that triggered a failure in a Telecom switch came only two days after emergency centre databases in Auckland, Wellington and Christchurch had been consolidated. A simulated outage to test cut-over procedures was planned but the real failure happened first, delaying the switch to a Wellington back-up site and the subsequent reboot at the Auckland exchange.[106]

The day after the crash the Consumers' Institute released the results of its annual ISP satisfaction survey revealing Telecom's Xtra was the least popular provider for the third year in a row. It found only 42 percent of Xtra subscribers rated its performance 'good' or 'very good,' trending further down on 55 percent in 2006 and 78 percent in 2005. Sue Chetwin said the ratings dropped further to 36 percent after Xtra's merger with Yahoo! wreaked havoc with its new 'Bubble' email service. Overall Xtra's performance revealed the greatest level of dissatisfaction with any ISP in New Zealand. "Broadband users have been promised so much in terms of faster speeds, larger data caps, and cheaper pricing, but our survey shows that most customers think they're getting a rough deal. And compared with overseas, there's no doubt they are."

TUANZ chief executive Ernie Newman said many people were starting to question the basic technical competency of the Xtra platform. "I think it's time that the public started hearing from the engineers and people who can give an explanation about what's going wrong here, rather than just from the PR department … Telecom have got to get out of the mindset of treating New Zealanders as technologically impaired." Newman said the power outage was another example of Telecom's technical equipment falling over. "If a phone company in 2007 can't run a reliable ISP that doesn't go off the air with extreme regularity, then there's something fundamentally wrong."[107]

COMPETITORS CONFUSED

Then the Commerce Commission signed off on the final fees competitors would have to pay to Telecom for accessing the local loop. There had been begrudging acceptance of the interim de-averaged figures for rural and urban areas announced in July and few expected a hike but that's what they got. The prices

were up 20 percent in urban areas to $19.84 per customer and up 14 percent in non-urban areas to $36.63 per customer. The determination covered a 15-month implementation with a soft launch at up to 15 exchanges between January to April 2008, and up to 15 further exchanges a quarter for the next year. This would result in up to 75 unbundled exchanges by April 2009.

InternetNZ public policy chairman David Farrar was disappointed, fearing tighter margins for competing LLU operators, which would inevitably be passed on to customers. An upward drift of such magnitude had caught the industry by surprise and was expected to have flow on effects.[108] ISPs eager to deliver on the pervasive broadband challenge were not only encountering resistance from their old nemesis but the government's Commerce Commission was also playing hardball.

Now in the embrace of state-owned giant Kordia, Orcon was expected to shine brightly in the new environment but was now warning of a big question mark over its plans for a world-class true broadband network. Its customers in the trial phase at five Telecom exchanges were getting speeds of up to 20Mbit/sec now Orcon chief executive Scott Bartlett, said the additional costs raised 'serious questions' about further investment. He believed the move by the Commerce Commission made achieving the government's own goals of getting into the top half of the OECD broadband ratings by 2010 'seem unachievable.' Bartlett was further concerned at the impact this might have on the business case for sub-loop unbundling particularly if Telecom announced aggressive cabinetisation plans, which could reduce the number of customers competitors could serve from Telecom's cabinets.[109]

Within three weeks Telecom's announced it would build an additional 2100 cabinets to shorten the copper loop and bring fibre closer to the customer by the end of 2009. CallPlus was taken by surprise, estimating around 50 percent of its customers would have to be serviced from those cabinets. While agreeing this was a step towards faster cheaper broadband, CEO Martin Wylie said the announcement made a 'mockery' of the Commerce Commission's LLU determination. "Why have we all wasted 18 months when we should have focused on different issues?" He remained concerned about the design of the cabinets -whether there would be enough room for future access by competitors – and at the lack of clarity about sub-loop unbundling.

Orcon's Bartlett believed Telecom had 'deliberately pulled the wool over the government's and access seekers' eyes.' His company had invested a lot of money into the local loop and the ramp-up of cabinetisation essentially made that redundant. Both competitors called on the government to regulate sub-loop unbundling to ensure equal access.[110] The risk with the higher cost of access – and the rapid move to shorten the loop so each cabinet served less customers – was that competitors could find their business cases for independent roll-out no longer stacked up.

Industry commentator Paul Budde was disappointed at Telecom's turnaround and wondered whether the show of good intentions in 2006 was little more than smoke and mirrors. "In good faith the industry has been pre-empting Telecom's positive attitude and made tactical changes to their organisations, and substantially increased their customer base in anticipation of the new environment. They now see that the emperor is not wearing any clothes and they are left stranded and in a financially very dangerous position."

Budde warned the competitive industry there was only a short life ahead for copper and DSLAM placement in Telecom exchanges, leaving them with wholesaling as the only viable option, which itself was likely to increase rather than fall in price. He believed the entry level of broadband in New Zealand would consequently increase to around $45 when in some comparable countries it had dropped as low as $9.95 but was on average between $19.95 and $29.95.

"These high broadband prices will be a major setback for economic progress and innovation in New Zealand, something the OECD has been mentioning for many years. The fact that Telecom didn't come up with a wholesale strategy indicates to me they have abandoned their co-operative

approach or perhaps their supportive behaviour has all been smoke and mirrors. If they do have a plan to take the rest of the industry with them, why didn't they announce that at the same time? This is a very worrying development indeed. We have learned from the past that innovation will be stalled when there is no or little competition and the current uncertainty alone is enough to kill any future investments by the competition."[111]

If it wasn't bad enough that Telecom was showing reluctance to open up its exchanges as rapidly as it had initially promised, there would now be triple the number of cabinets within two years, each servicing fewer customers. Competing carriers planning to place their own equipment in these roadside cabinets were forced back to the board room to explain the long-term benefits of delivering broadband over a copper loop that was about to disappear as quickly as the business case for unbundling.

Meanwhile the Commerce Commission, in allowing access prices to be pushed up, rather than removing the obstacles that were in the way of a more competitive environment, had undermined its own mandate – to 'enforce legislation that promotes competition in New Zealand markets'[112] – and helped make a mockery of the government's goal to streamline broadband roll-out. In tandem with Telecom's obviously pre-meditated announcement on cabinet roll-outs it had inadvertently helped disempower the very people the new environment was supposed to be encouraging. We were getting mixed messages again.

ICT REMAINS UNFOCUSED

At the end of July 2007 the government announced it would help get ICT-NZ up and running – with a two-year grant from New Zealand Trade and Enterprise – as the body representing the broader interests of the sector

Economic Development Minister Trevor Mallard said the government had identified ICT as an enabler, "an industry which enables other industries to achieve growth and is likely to have a strong positive impact on the New Zealand economy."

The announcement had industry commentator Bruce Simpson comparing the group, allegedly representing a $15 billion industry sector, to Theresa Gattung applying for a WINZ[113] benefit. "Apparently … ICT-NZ is to get a fistful of taxpayer dollars because it is unable to meet its own operating costs," Simpson complained on his Aardvark blog. "This is despite levying its members up to $20,000 a year in fees. Something doesn't quite seem right here."

However acting chief executive Garth Biggs insisted ICT wasn't a rich industry and the total turnover figure was misleading. "We're an industry that consists of between six and 20 large companies and 8000 struggling small ventures – small either because they're entrepreneurial or because they want to stay small. The ICT industry is "no different from the biotech or organics industries, which have already received funding."[114] While Biggs had no desire for the group to be government funded in the long term, he said, this was the only way to get the ball rolling. "We need to be big and mature enough to look after ourselves, but we need something to build on."

CHANGING BUSINESS

He believed Digital Strategy goals had been too government focused and the vision for the future needed to be opened up and owned by a broader

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base, to encourage industry to upskill and work smarter and ensure ICT success stories were being heard by the right people.

Many companies were using technology well, some were using it defensively or simply as a tool to run their business rather than for making their businesses smarter. "It's not just about computerising and making things work faster but how you can change your business. ICT is the best solution we have to our productivity problems. It has been well applied by the banking and airline industries in changing the way they do business and that's what all industries need to be looking at."

The way forward was about connecting companies to customers and suppliers in effective ways and about productivity and efficiency gains. The tools were there but more examples were needed to show the business community how investment in ICT could not only transform business but have an impact on the whole country, and on productivity and per capital income.

Biggs, who had held senior IT roles at Air New Zealand and Gen-i, also headed the HiGrowth Project Trust, a government-funded group originally tasked with creating 100 ICT firms with $100 million in annual turnover by 2012. It later dropped this goal as unachievable. Biggs wanted to see greater flexibility and more realistic targets across the sector, for example $500 million or $10 million revenue.

Achieving 10 percent growth in GDP by 2012 remained a prime target as did increasing productivity in local government, particularly where similar solutions could solve common problems and increase overall productivity. HiGrowth had channelled $80,000 of public funds into ICT-NZ, which was roughly matched by the now-defunct ITANZ and the Software Association. Corporate members were asked to pay fees of up to $20,000 a year to join ICT-NZ, which hoped to employ six staff, in Wellington, Auckland, and Christchurch.

CHALLENGING TARGET

According to Statistics New Zealand the IT industry, excluding communications, contributed about $7 billion to the New Zealand economy in 2004. However only one percent of companies had annual sales exceeding $15 million and generated approximately 80 percent of the IT industry's contribution to GDP. The growth needed to reach the proposed 10 percent GDP target would have to come from an increase in the number of companies operating at above $20 million of annual sales, and if achieved would still only bring in $16 billion by 2012.

HiGrowth believed a sound information base was needed to help identify niche market opportunities and trends, and factors that may contribute to success in product development, commercialisation, and exporting. Resources were also needed to enable them to enter and develop offshore markets and build a global presence.[115]

The August 2007 Business Software Alliance (BSA) global study of IT competitiveness didn't exactly deliver the kind of results the local ICT sector wanted to hear. New Zealand was ranked 17th out of 64 nations, well behind leaders, the United States and Japan. The BSA, which commissioned the study, identified Australia as being among the best in the world, ranking it fifth out of 64 countries when it came to IT infrastructure and global competitiveness. New Zealand ranked

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17th, just behind Germany and Ireland, but ahead of France and Austria.

The scores were based on PC ownership, broadband adoption, government regulation, enrolment in higher education, IT employment, the business environment, research and development spending, and cyber crime laws. New Zealand ranked eighth in the overall business environment category and for human capital[116], and ninth for labour productivity, with US$148,384 output per employee. Taiwan led the category with US$386,413 per employee. New Zealand was 13th for government support of the IT sector but fell to 17th place for its legal environment rating, and 19th for research and development and for IT infrastructure.

'Given the national significance – and enormous cost – of deploying advanced communications networks, government vision and commitment is often required to encourage their spread,' the report said. 'National infrastructure initiatives benefit the IT industry, of course, by providing businesses of all sizes with the ability to network easily with suppliers, partners and customers.'[117]

Meanwhile long-time industry advocate John Blackham was concerned at the number of large ICT organisations who had normally invested in cross-industry initiatives now moving offshore, essentially making New Zealand a branch office of Australia. "There is no longer the cash to cobble together a formal 'industry' representation. InternetNZ recently tried to engage with 'the industry' to put on a show of all the achievements of our indigenous ICT people at the Beehive but no one wanted to collaborate," he said.

Blackham said it was ironic that ICT was driving productivity forward all around the world with the exception of New Zealand, where our productivity was actually falling. "It was a national disgrace that not one dollar went into the ICT vote last year and the same will probably be true of the upcoming budget round."

At the APEC summit he ran into Chinese representative Jack Ma, founder of Alibaba, the world's largest B2B Internet company, with 16 million companies trading. "His vision for ICT in China is for the Internet to drive productivity, completely bypassing the big old legacy providers such as SAP and Oracle, and creating a nation of nimble small to medium enterprises in a connected supply chain that can beat any of the large US corporates on price, delivery and quality while paying US-style wages." Blackham said he was encouraged in his endeavours by the Chinese Government. "Wouldn't it be great to have that level of support here?"

POOR COMPARISON

The 2007 'Connecting to Our Digital Future' report confirmed that New Zealand levels of ICT research and development expenditure compared poorly with OECD leaders and other countries of similar size. Our capability, said the report, was hampered by a diversity of unco-ordinated effort, and a lack of focus on speed to market and competitiveness.

It recommended the government form an overarching ICT industry advisory group consisting of the two key ministers, key government representatives, ICT-New Zealand, and leadership from UCi3, the New Zealand ICT Innovation Institute, based at the University of Canterbury, with its own board of directors. This new body would focus on producing greater cohesion in
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R&D efforts, making resources more accessible to industry through simplified processes and procedures, with greater emphasis and reward for focusing on competitiveness and speed to market as opposed to basic research and publication.

"We need a strong, innovative, competitive ICT Industry here in New Zealand to maintain our point of difference in just about every global market we compete in – from agriculture to film production and fashion design," said HiGrowth's Biggs. "The infrastructure issues are not just about broadband speed. The report identifies a large number of recommendations which need to be addressed if New Zealand's ICT industry is to obtain the infrastructure needed to fulfil its potential and maximise its contribution to economic growth."

Biggs said the country's ICT manufacturing capability was under threat and if we lost the ability to build prototypes and high-quality test runs this would pose a substantial threat, to retaining product development here. The report also highlighted the need for far greater collaboration across all research and development providers. "We are too small a country to be duplicating effort and funding bricks-and-mortar when brains and know-how are what is required … The solutions put forward are about industry and government working in partnership to provide leadership and investment into the ICT sector. None of these issues are going to be solved in isolation. Not by industry alone – or by government alone."[118]

Then within four months of funding being approved for the new umbrella body, the government closed its purse and based on its own internal advice, was about to reinvent the wheel. In November it pulled the rug from under both ICT-NZ and HiGrowth, ending their funding and proposing a new group to represent the sector. The news came as a shock to both groups, who had not been consulted. On-line industry publication *The Line* said the move created yet another industry group 'train wreck' and questioned how the industry could get traction when the groups that sought to represent it were being made redundant by the government. The MED had issued a request for proposal to "establish a collaborative and representative sector body to help create the necessary conditions for using ICT to its full potential."

Garth Biggs representing both bodies, said funding would run out well before either was able to achieve its objectives. He admitted ICT-NZ had not caught the imagination of the industry or the government. "We needed the government behind us and the government said we needed the industry behind us and neither side has been able to break that deadlock." He said New Zealand had too many small organisations that were far too "geographically focused" to work together as one entity; however, the funding had been pulled before it had even begun its membership drive.[119]

David Cunliffe said the government wanted a 'stronger unified voice for the broader ICT sector,' to continue the work carried out by HiGrowth, ICT-NZ, and the Digital Strategy Advisory Group (DSAG). He wanted to "ensure all sector and community interests are heard and adequately resourced by an umbrella group."[120] But even that seemed to be something of a whitewash as an allegedly censored PDF document, which briefly appeared on the Digital Strategy

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web site, revealed government advisors' opposition to an umbrella body purely concerned with the fortunes of the ICT industry. A September Cabinet paper had questioned the future of HiGrowth and ICT-NZ and the minister's own advisory group had recommended funding cease.

The badly edited in-house report that got temporarily aired on the Web claimed the fact HiGrowth was receiving funding from government and in turn partially funding ICT-NZ was debilitating both organisations and making it difficult for New Zealand Trade & Enterprise (NZTE) to administer and monitor what happened to that funding. "In addition, overlapping membership of the governing bodies of HiGrowth and ICT-NZ has raised the potential for conflict of interest issues to arise," the paper said. All of which was in stark contrast to Cunliffe's announcement about the new government-led body to be established in 2008, building on 'the great work' of both bodies.[121]

John Blackham warned a body made up mainly of government officials could easily distort the government's position. "Whatever ICT experts tell government officials, it always comes out looking very different in the eventual report." He preferred a body similar to Federated Farmers or the NZ Manufacturers' Association with at least 50 percent industry membership as a forceful advocate with government. Ideally there would be a productive partnership, with government identifying economic problems – such as our lack of productivity – and then asking ICT for proposals on how to solve these. "I want to see the government put out initiatives that the industry can get its teeth into and the venture capitalists can come in behind."[122]

Despite decades of reports and pleas to back ICT industry training, development and export initiatives and lofty statements from government about how that sector was the key to prosperity the goal posts kept changing. Part of the problem was the broader industry's partisan 'islands of interest' mentality, which prevented construction of bridges to common ground and the failure of government to create the right environment for this sector to flourish.

In fact in November at the first NZX Technology and the Markets forum it was intimated that Treasury had a sceptical view of the ICT sector. "They argue that if New Zealand had a natural advantage in ICT, we'd be in it already," said Stock Exchange CEO Mark Weldon. This attitude he said was reflected in the story of two economists walking down the street when one remarks that there seems to be a $10 note lying on the footpath in the distance. "There can't be," said the second economist; "if there were, someone would have picked it up by now." "To me as a layman, the only natural advantage in ICT is being first," Weldon said.[123]

Almost as soon as the government went public with its proposal, industry groups began rallying to discuss the possibility of consolidating. An inner grouping including InternetNZ, TUANZ, the Computer Society, Women in Technology, Government Information Systems Managers (Govis), and the Association of Local Government Information Managers (ALGIM) were allegedly discussing greater cross-sector collaboration. It was rumoured discussions had been planned ahead of the government announcement. Further meetings were planned ahead of the 2008 deadline to try to reach some accord with the government's proposal.[124]

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Next step Internet

High fibre diet required

> The government has identified the lack of such infrastructure, as constraining the development and introduction of advanced technology and business applications and, therefore, as a 'critical issue' in achieving economic transformation.
> Cabinet Policy Committee, 21 Aug 2006[1]

New Zealand was still tinkering with the engine of the old economy and trying to modify yesterday's technology to cope with demands it wasn't built for. While more visionary nations, were reaping the economic and social benefits of multi-gigabit light speed communications.

More affordable, future-proofed, fibre-optic infrastructure was driving huge global advances in collaborative research and development and e-commerce. Our science, technology, and academic community – already late to the game with its first generation advanced network – was being lapped by other nations onto third and fourth generation connectivity. Meanwhile a large 'under reconstruction' sign was up over the Internet as we knew it, signalling further changes and challenges ahead.

While the government seemed happy to re-regulate and threaten telecommunications providers if they didn't lift their game, it had done precious little to aggregate existing state-owned networks, make direct investment, or assume the kind of leadership necessary to boost our information superhighway capabilities.

Internet visionary, Simon Riley.

Internet visionary Simon Riley warned that New Zealand's lack of investment in next generation infrastructure was symptomatic of a larger policy failure, while similar sized nations were treating investment in next generation fibre-based telecommunications as an arms race. He urged the government to take a close look at the kinds of ICT strategies being embraced in Singapore, Korea, Japan, Taiwan, and Hong Kong, which had gone way beyond infrastructure.

"They are on to the next generation of applications and if we're

not careful the advances happening there will see us slipping into near-developing-world status." Canada, the United Kingdom, and Holland were on version 5.0 of their respective advanced networks while New Zealand was still struggling with version 1.0, which was no longer advanced by world standards.

Japan's next-generation broadband strategy planned to eliminate zero-broadband cities and towns by 2008. It already had 95 percent coverage with 80 percent of the population on ultra-high speed, and by 2010 expected to have 100 percent broadband coverage with 90 percent of households having access to bidirectional 200Mbit/sec speeds.[2] The resulting plunge in DSL deployment had a big impact on carriers who were focusing on copper enhancement technology, with a growing number of households now disconnecting in favour of fibre to the home.[3]

South Korea had unveiled a grand vision for its IT industry in 2005, designed to raise the level of per capita income by 2010. As part of its U-Korea (Ubiquitous Korea) plan, the government was backing next generation growth projects, envisioning a future where people had uninterrupted Internet access via fixed lines or mobile networks, any time, anywhere.[4] This involved a wireless broadband portable Internet service, a broadband convergence network, a digital mobile broadcasting service, a home network service including interactive TV, video-on-demand and e-health and e-learning services, a digital terrestrial HDTV service, and a planned transition to IPv6.

There had been talk of moving to the next generation of the IP for a decade and it would soon become a major issue if the Internet was to expand in the way the innovators and engineers knew it must. The theory was that almost everything that could communicate soon would, including cars, microwaves, fridges, wristwatches, cellphones, and much more.

That would ultimately require upgrading the IP transport layer to provide more addresses and greater flexibility. The network software layer also needed optimising so machines could have more complex conversations with each other. The European Telecommunications Standards Institute (ETSI) and the IPv6 Forum had joined forces in the late '90s to promote the next generation of Internet protocol numbering, developed by the IETF:

"IP6 will allow networking to extend to consumer and industrial devices like mobile phones, fridges and toasters. 'We will need around 100 IP numbers each in 20 years' time,' said Latif Ladid, president of the IPv6 Forum. As well as addressing space issues, IPv6 will add security and quality of service to the IP world, he said. Mobile devices become more suited to accessing the Internet with increased wireless bandwidth in the offing and the emergence of wireless application protocol devices (WAP)."[5]

It had been extravagantly predicted that the four billion addresses available under IPv4, the existing 20-year-old 32-bit system would be gobbled up by 2005. There was an urgent need to move from this increasingly fragile environment to the 128-bit IPv6 addressing scheme, extending capacity to 340 billion billion billion billion addresses to meet the largely unimagined requirements of the distant future. In 2001 IPv6 lead designer Steve Deering warned things would only get worse if there were further delays. Many opportunities had already been lost because existing network address translators (NATs) only worked with certain types of applications. IP telephony and peer-to-peer gaming, for example, wouldn't work through network translators.

Cisco, Intel, 3Com, Ericsson, Hitachi, Nortel, and others were rapidly upgrading their equipment for IPv6 compliance for the new world of IP everywhere. In Yokohama, Japan, taxis, buses, and delivery trucks were continuously monitoring road conditions, speed, and weather in an IPv6 project called 'real-space' networking. Toshiba had been using IPv6 for its smart kitchen project, giving every appliance an IP address for instant maintenance and monitoring. Nokia was demonstrating its Mobile IPv6 technology for location-based directory and 'always-on' services, and Sony was preparing all types of media, including broadcasting, to be Internet-enabled using IPv6. In the future all Sony products would have an IP address.[6]

We were also reminded of how enthusiasm can get ahead of itself when in 2007 a revised estimate was made of how we were holding out under the present IPv4 system. We hadn't run out but some people were concerned. In fact New Zealand had made very little progress in implementing IPv6, although the .nz Registry Services division of InternetNZ had upgraded its dot.nz name servers – located in Wellington and Albany, north of Auckland – to IPv6 connectivity. The new KAREN, the fulfilment of a dream set in motion by the country's Internet pioneers 20 years previously, was also running IPv6.

Forester Research had written a premature obituary for the Web as we knew it in 2001, claiming it would be supplanted by the X Internet (X = executable) by 2005. Downloadable code, enabling more entertaining and engaging experiences with on-line services, and the proliferation of smart Internet-enabled devices would reshape its role, it claimed. Real-time information on 'everything from anywhere' would enable businesses to have better control of their enterprise. The market for Internet devices and services was US$600 billion annually, and by 2010 it was expected to have rocketed to more than US$2.7 trillion worldwide, with 14 billion devices on-line.

Then as visions of the Internet of the future were spinning in our heads, news of the next generation research, science, and academic network reached us. Work had begun in 1996 and by the end of 2001 Internet2, the super-high-speed network being developed by 180 US universities in conjunction with large corporations and research networks in Canada, Europe, and Australia, was raising the bar. The next step development being funded by the NSF used protocols and middleware to support applications only recently dreamed of. The 'Abilene' Internet2 backbone operated at up to 2.4 Gbit/sec for very large file transfers, such as beaming holograms into an auditorium in real time, or telemedicine, where 3D images of organs could be sent to doctors around the world. At this stage New Zealand hadn't even begun to consider whether it had a place in the advanced networking community.

CALLING NOO ZEELAND?

In the late '90s Simon Riley and his partners shut down Pronet, a nationwide wholesale bandwidth provider, after a prolonged law suit with Clear Communications, whose network had been so unreliable it had cost them their business. Riley, who had been a public policy analyst in Canada, went back to the advertising industry for about 18 months, before becoming involved in policy work regarding the future of the Internet in New Zealand.

He'd been asking around in government circles why the country didn't have an advanced science and technology network. "I had seen all these policy papers coming through but nobody was making any references to advanced networking here, even though there was plenty of activity offshore. I tried to find out who would be responsible for such a thing and nobody appeared to be even interested."

Riley couldn't believe that a country talking about becoming a knowledge economy had no aspirations to develop a nationwide high-speed research network, so he dived headlong into projects that gave him leverage to begin lobbying for one. He contributed to Howard Frederick's '*Knowledge Economy Report*,' as well as conducting research, subcontracting, consulting, and running courses in the e-commerce arena. At an event at the eVision centre in Wellington in May 2001 Riley found himself in the company of many of the original Tuianet members who had brought the Internet to New Zealand, including John Houlker, John Hine, and Neil James. There and then he arranged a meeting of minds with a view to raising awareness about the need for a gigabit backbone. The group organised an open meeting with academic and industry luminaries as a call to action for a national science and research network.

The following week, by coincidence, he found himself elected to the council of InternetNZ. His first official business was to propose and form the affiliated but 'arm's-length' Internet2 Committee, which included the core Tuianet crew and others advocating for a gigabit network. NZTE gave the group $50,000 to deliver a capability study with support from InternetNZ, Industry New Zealand, The University of Otago, and Cisco Systems. It commissioned Laurence Zwimpfer to research and compile *Collaborating at Speed*, published in October 2002:

The time is right to proceed with the implementation of an NGI. The opportunities presented by broadband networks have been known by technologists for over 15 years (and by science fiction writers for over 30 years), but most businesses and members of the general public have had little conception of what a broadband future might be like. This is changing rapidly. Helped along by initiatives such as Digital Trade Routes (high-speed links to North America and Singapore) and PROBE (Provincial Broadband Extension), there is growing awareness of what is possible and in an increasing number of cases, frustration with today's limited and costly services.

New Zealand needs to be careful that our tiny market is not fragmented by narrow sector interests. There is a need for ongoing consultation and co-operation amongst these initiatives. The NGI committee will insist upon a transport model similar to that deployed by AARNET, which actively encourages a wide range of activities. AARNet has achieved its flexibility by seeking other suppliers of backbone infrastructure to avoid the business conflict of interest in reselling services from the traditional telecommunication providers. In Australia, Canada and the USA this has been an option because of the healthy growth in competition for the supply of backbone wholesale bandwidth services.

New Zealand does not have this option today. Wholesale services are available from metropolitan area network providers (CityLink and United Networks) and from international provider Southern Cross Cable Network (SCCN), but they are not currently available between cities. This limits the options for a national NGI to a business partnership with an existing provider or the establishment of new infrastructure, which would probably need to be in partnership with an organisation with ownership of a national right of way (Transpower or Tranz Rail). The Steering Group recommends that both options be explored in more detail when funding is assured.[7]

Zwimpfer investigated the administrative structure and funding required from various partners to get things moving, believing a business case could be ready by the end of 2002 and contracts let in May 2003, with the network operational four months later. "It is no longer a question of whether New Zealand needs an NGI; the challenge now is to see how quickly we can establish one." While Deputy Prime Minister Jim Anderton had enthusiastically endorsed the report, "Access to next generation Internet is crucial to fulfilling the government's aims of encouraging world-class innovation and strengthening global connections," the response from other ministers and government officials, including Communications Minister Paul Swain, was negligible.

With the help of InternetNZ the pioneering group formed Next Generation Internet New Zealand (NGN-NZ) as a non-profit society, with Dr Neil James, assistant director of information services at the University of Otago, as chairman. He warned that New Zealand's information technology industry would suffer unless we forged links with Internet2, claiming the nation's research community was already hindered by a lack of affordable high-speed bandwidth.[8]

The new network would be based on the leading-edge IPv6 protocol, which would make more effective use of greater bandwidth, allow users to send and receive time-dependent files such as voice and video in a more reliable way, and use technologies beyond those currently available on the

commodity Internet. Rather than just a TV set with a picture of a head at each end it could provide a whole wall of video or 3D images that could be manipulated between distant groups.

VIRTUAL MEETING PLACES

In the past universities often sent individuals overseas on sabbatical for several months to work on projects. This network would provide extra 'human bandwidth' including body language, so people felt more comfortable working at a distance. As well as more media-rich video-conferences or 3D work-groups, there were likely to be many commercial spin-offs for the development of leading-edge applications. Otago University had a good reputation for spinning-off businesses, including Australia's leading computer graphics production house Animation Research (ARL), which went on to develop graphics for the America's Cup and sports events worldwide.[9]

Most of the Tuianet crew were on board NGN-NZ, and Riley was secretary. They hired Tone Borren as chief executive, and were doggedly determined that with or without overt government support they were going to build a network. Of course the first port of call was to get the country's universities to subscribe, then half the Crown Research Institutes and the National Library. It was déjà vu, with all the old partners in the original Internet backbone paired up again and ready for a next generation, speedier, more robust, backbone that would liberate them from the grip of costly per-megabyte commercial bandwidth, and take them to gigabit heaven.

The new generation fibre-optic network would enable secure, high-end computing, capable of moving large amounts of information between databases for climate modelling, creating video walls, or manipulating 3D images between cities, or even across the world. Chairman Neil James conceded that for financial reasons a full national network might not be possible initially, but some elements were expected to be live late in 2003. "The technical side is not difficult, it's more the business and political relationships – once these are sorted things could happen quickly."

NGN-NZ's dissatisfaction with the current telecomms model for bandwidth charging remained a concern. Prices were not based on the cost of provision; if you operated at 1 Gbit/sec and suddenly required 2Gbit/sec that was likely to double the cost, but under the proposed model, once the fibre was available, extra bandwidth would come at a small marginal cost. Virtually every other OECD nation had advanced networks. Higher learning institutions in the United States, United Kingdom, Canada, and Australia were already logged on to the Internet2 network. "If we don't exploit the capabilities of this technology we will be left out in the cold as far as international research is concerned. More and more research is done in collaboration and advanced networking is required," warned James.[10]

A decision was made to go to the market with a request for information to see what bandwidth providers and network equipment vendors were prepared to offer. Telecom and CityLink were on the shortlist and a decision was imminent. It was thought the Tranz Rail-owned fibre-optic cable between Wellington and Palmerston North would provide an important building block. The fundamental design would be based around Gigapops in the main centres including Auckland, Hamilton, Palmerston North, Wellington, Christchurch, and Dunedin. These neutral open connection 'points of presence,' based on the leading-edge IPv6 protocol, would be capable of gigabits per second throughput. While the government had shown strong interest in the network it had also made it clear most of the funding had to come from private initiatives.

"We were down to the final selection from the tender documents and weeks away from signing contracts, when the government decided to step in." As a result of the 2003 Knowledge Wave gathering, keynote speaker Rita Caldwell, then director of the US NSF, had put a challenge to the government. She asked how New Zealand expected to continue working with all the

nations that had advanced networks, when it didn't have anything even on the drawing board. She met with Prime Minister Helen Clark and Science Minister Pete Hodgson and warned them our whole science and research community was in peril if it wasn't connected to the rest of the world. Hodgson finally realised he needed to do something and the government agreed to dig into its coffers.

SHAMED INTO ACTION

The government injected $200,000 to build a business case for a Gbit/sec network, across national research institutions and out to an international link. A six-person steering committee was established, headed by the MoRST, and including the Economic Development Ministry, Trade and Enterprise, the Ministry of Education, Treasury and the Tertiary Education Commission. MoRST general manager of strategic development, Andrew Kibblewhite, said the business case would pull together details of likely demand from the research, education and innovation sectors, and evaluate the best ways of providing and funding a network. The group would co-operate with NGI-NZ, which had 13 members – primarily universities and Crown Research Institutes – each of which had paid $15,000 to join. It was hoped work might begin early in 2004.[11]

Simon Riley and those left on the NGI-NZ committee kept faith, even though their ideas had largely been assimilated into the government's big idea. They believed things would now move along rapidly, as they'd essentially done the groundwork. Inevitably a number of the NGI-NZ committee members, because of their expertise and ongoing lobbying, ended up on the advisory board for the new network.

The steering group research leaned heavily on the work already done by NGI-NZ and reported back that that New Zealand's researchers were indeed being treated with a 'less than enthusiastic response' from international players, once they discovered it didn't have an advanced network. If New Zealand did not provide international links to other advanced networks, our scientists "will be on the back foot, and falling behind fast." Without a comparable network it would simply be impossible to participate in international projects that had spin-off economic and social benefits.[12]

NGI-NZ was commissioned by the MoRST to manage an interim $8 million capability development fund to start training people and running practical demonstrations of a temporary network of access grids, set up with Wellington's CityLink and the universities, which Riley called NGI-Lite. The government then formed 'the committee from hell,' which dragged on for about two years to go through all their processes.

By mid-2004 NGI-NZ chief executive Tone Borren expressed his frustrations. He'd had enough and was stepping down after 18 months of lobbying. He slammed New Zealand in his parting speech for failing to take advantage of its existing fibre capacity. Computer speed had doubled every 18 months for the past 15–20 years, data storage kept doubling and optical fibre capacity had doubled every 9 months. "Networking capability over fibre-optics has grown beyond the capability of computers and we didn't get to see any of that."

While Cabinet had agreed to support the proposed gigabit network linking 127 sites throughout the country in partnership with MoRST, Borren warned we were still way behind most of the world. For example, bioengineering professor Peter Hunter at Auckland University had developed mechanical models of the human heartbeat and needed to work with experts offshore as part of a virtual organisation. The only thing holding him back was access to the network. New Zealand needed to take part in weather, humidity, and earthquake monitoring and multi-band videoconferencing.

"An observatory in the US wanted to upgrade the Mt St John observatory to take part in an international astronomy experiment which uses 12 different wavebands, collecting 200 terabytes of

data nightly, but we don't yet have network to connect into that." While research networks in the United Kingdom and Canada were now capable of handling terabytes per second and the rest of the world was connected at Gbit/sec, even Costa Rica and Fiji were joining the 48 other nations, while New Zealand hadn't even begun work on its next generation Internet.[13]

Then something finally happened. Crown-owned Research and Education Advanced Network of New Zealand (REANNZ) was formed as the operating company for what was to become the KAREN. The network was officially commissioned on 15 December 2005. Meanwhile NGI-NZ stayed in holding pattern with Riley taking over the CEO role. "We were still trying to decide what we should do with it, shut it down or try and morph it into something else." Within a year it was mothballed. "MORST remained in denial about NGI-NZ because they finally recognised what we had been doing and I guess they didn't want someone asking, 'Why didn't you do this five years earlier?'"

TUIANET MK II

When the nation's universities and research institutions were pulling together the threads of what was to become New Zealand's first nationwide Internet backbone, there was a grand goal in mind: a national science, research, and education network. Those grey beard visionaries achieved their goal without government funding, but shortly afterwards Telecom and Clear cherry-picked the various institutions with tempting deals and the collaboration collapsed. Now, exactly 17 years after the first Internet connection into the US Internet backbone was lit up at Waikato University, the original vision was back on track.

In April 2006 TelstraClear and its subsidiary Sytec won the $43 million government contract to build and operate the KAREN network for REANNZ and run it for four years. Research institutions and academia would match the contract figure for further development, and gain access to 10Gbit/sec on TelstraClear's national fibre-optic network, running on a separate wavelength to its commercial traffic. Network routers and switches would be operated by REANNZ but managed by TelstraClear. After five years the network was expected to be self-sustaining, with operating costs met through member subscriptions.

Chief executive Charles Jarvie said there was never a mandate from the government to build any infrastructure, only to facilitate connectivity throughout New Zealand and the international research community. Members would connect for standard 1Gbit/sec links through points of presence at CRIs, universities, and ISPs. Smaller members would only take 100Mbit/s circuits. The first link was between AgResearch in Dunedin with Crop & Food in Invercargill.[14]

TelstraClear subcontracted Juniper Networks, the leading provider of broadband routing in New Zealand, to deploy its M-series multi-service routing platform, to direct traffic across the backbone, and handle the extremely high-end computational processes and information sharing on the IPv6 network. *Computerworld* journalist Stephen Bell asked REANNZ executive Charles Jarvie in September 2006 how it was that New Zealand had got so far behind the 40 other nations that already had advanced networks for science and education. Jarvie gave the *Reader's Digest* politically correct, condensed version: "The stumble, Jarvie says, came in the mid-1990s, when the Internet became a popular medium and the core infrastructure was turned over from the universities and research establishments, which had run it, to the major telcos. In other countries, the universities went straight on to build their own special-purpose higher-capacity networks. In New Zealand, it fell off the radar for 10 years, and educational and scientific organisations were content to buy capacity from the telcos."[15]

KAREN went live in mid-December 2006. The high-speed virtual communications link between

tertiary institutions, research organisations, libraries, schools, and museums was 10,000 times faster than most domestic broadband connections. Its 18 founding members, the universities, CRIs, and the National Library, had signed up for three-year membership agreements. It soon had 16 members with POPs around the country connected to 28 sites, and peering agreements through 13 other national research and education networks (NRENs). It had two international connections, one to Sydney and one to Seattle. Through those international links it could reach 40 other NRENs and the institutions connected to them.

CRIs, including IRL, undertook a large amount of research for industry ranging from applied mathematics to new materials, imaging and sonar systems, and communication systems, such as optical switching fibre systems and wireless networking. They supported many national industrial partners and collaborated with universities. For example, IRL was actively engaged in wireless research with Auckland and Canterbury, and to a lesser extent with Waikato (WAND group) and Victoria University. Such research between universities and industry was supported by a number of companies including MediaLab, a successful ICT research aggregator. KAREN was exactly what they'd been waiting for to enhance their collaboration.

MediaLab functioned as a kind of mediator between high-level ICT research and practical industry applications. Or, as chief technical officer Peter Chappell put it, "matching big brains to real-world problems." It worked with universities, government, and private industry researching critical areas of ICT development. MediaLab was engaged in a project with Auckland University and Korea's Electronics and Telecommunications Research Institute (ETRI) in the development of cutting-edge "FTTX – or Fibre to the X – where the X is a premise, node or screen." New Zealand trials were being considered of the WPON equipment, which passively splits multiple wavelengths of light that travel down fibre. This would radically reduce and possibly even eliminate the need for electronics inside a roadside cabinet for delivery of high speed broadband from the node to the home or business.[16]

Donald Clark, REANNZ advanced network CEO, and former telecommunications advisor to the prime minister.

KAREN chief executive Donald Clark said one of the most popular early uses of the network was videoconferencing. Research and development service provider Scion had staged a five-hour video-conference between Rotorua and the United States to further research collaboration, and participants had commented on the reliability and quality of the connection. AUT had launched its new access grid suite, allowing staff and students to engage with colleagues in New Zealand and around the world. The University of Auckland had used a portable access grid to connect with colleagues from Oxford University in England on mathematics education.[17]

The National Library of New Zealand signed an agreement to connect to KAREN in May. Chief executive Penny Carnaby said the all-you-can-eat broadband capability would enable it, and potentially all the libraries of New Zealand to bring global knowledge networks to every New Zealander and showcase New Zealand digital content and stories to the world. "Our customers want access to Web-based multimedia experience, with rich content, video, sound, and high quality pictures, KAREN provides the capacity to deliver this."[18]

ROADMAP FOR RESEARCH

A roadmap through to 2009 was part of the output agreement between MoRST and REANNZ. The 2007 document outlined the skills and competencies within the KAREN community and sought to identify further professional development needs, along with the support structures, relationships, policies, and funding mechanisms to help expand the community of users. It needed to identify, develop, and deploy technical capabilities including hardware, middleware, and software applications. Collaboration was pivotal, both in terms of existing arrangements and how future local and international relationships might develop.

It took a broad perspective about how KAREN might embrace biotechnology, ICT, the creative industries, design and screen production, food and beverage, social sciences, and cultural areas. It would look at existing and new centres of research excellence, international research and partnerships, and how to develop valuable collaborative endeavours through the use of high-performance computing, access grids, videoconferencing, virtual research environments, visualisation, knowledge management tools, data mining, multimedia learning, and research resources. It would attempt to gain remote access to scientific sensors, telescopes, microscopes, and other valuable tools. The roadmap's ultimate goal was to improve the outcomes for the education and research sectors using KAREN, and develop related infrastructure and services.[19]

By 2008–2009 KAREN planned on adding 100 schools with five connections and eight content or service partners with a connection each. In 2010 it planned to add a further 200 more schools with 200 connections and 20 content or service partners with a connection each. "As more peering relationships are put in place, the network reach would extend, and more overseas network members would be aware of New Zealand's availability to participate in new research and education collaborations," said the REANNZ statement of intent.

KAREN was able to get to more than 90 percent of the North American and European routes, and 33 percent of the potential peering partners at the Pacific North-West Gigapop in Seattle. "It is unlikely that we will ever secure our target sector income from schools and libraries by approaching each institution separately (2600 schools and 260 libraries!). It is critical that planning for these sector networks has KAREN at the backbone and REANNZ as a trusted advisor."[20]

In his first annual report, REANNZ chairman Jim Watson[21] applauded the attempt to finally deliver an advanced science and education network, but said it was imperative the momentum was maintained:

> *KAREN is not just about accelerating existing collaborations. KAREN is pushing research teams to think differently about what is possible, to work more closely with their technical support to attracting more funding. [It] enables New Zealand researchers to be equal partners with approximately 60 countries who are members of CERN[22] in the search for new particles. KAREN will enable real-time, direct access to the new Australian synchrotron[23] facilities and data generated from collaborators worldwide.*
>
> *From a physical perspective, KAREN is a national and international ultra-high-speed data network linking the research, education and innovation sector. It was the first foray by this government into a centrally co-ordinated infrastructure investment programme for research, and, arguably, the first major investment in new national infrastructure investment this country has made in decades. So far, KAREN is proving a success but the need to move science infrastructure investment onto a more sustainable basis is urgently needed. Australia has made substantial process in the last couple of years and it is heartening to see the Ministry of Research, Science & Technology consulting on this problem.*[24]

Meanwhile the research community continued to come up with new uses for the advanced network. New Zealand's major universities were using an access grid to combine multiple video streams from different sites into a single collaborative space. Nathan Gardiner, co-ordinator for the New Zealand Access Grid and IT manager of the Human Interface Technology Laboratory (HIT Lab) at Canterbury University, said the open source research tool used multicast traffic on the KAREN research network to enable people in different places to meet in a 'virtual venue.'

It worked in a similar way to a chat room. You logged on and inside the venue server were virtual rooms. You could create your own virtual room or meet someone in a particular type of room. Multiple meetings could occur concurrently across the country. In 2006 Gardner had participated in an international meeting where 100 different sites were linked in. The Access Grid also provided interfaces to grid middleware, enabling the creation of new tools for collaborative visualisation, data-sharing, remote control of instruments, and interaction with other grid resources. "It's like videoconferencing on steroids ... Not only does it do videoconferencing; you can also share your laptop screen, 3D models, data sets or other information, or share virtual meeting spaces."[25]

Expat Kiwi Ian Foster, considered one of the fathers of grid computing, said there was no longer any excuse for New Zealand researchers not to be involved on the world stage. He told attendees at KAREN's first international event in July 2007 that grid computing had changed the way researchers thought about problems, opening up ways to approach things differently. It was now possible to instantly make data or analyses available to research colleagues, instead of having to download from FTP[26] sites or wait until the research paper was published.

While the first generation grid computing was about on-demand access and batch computing, the second generation paved the way for service-oriented science, which in Foster's view was the future of e-research, and would reduce time spent on mundane tasks. Service-oriented architectures meant developers could provide information tools as services clients could access, so manual data-processing and analysis could be automated.

Grid technologies could accelerate the development and adoption of service-oriented science. Grids were communities of people as well as computers, and were based on trust in order to share resources and services. KAREN enabled New Zealand researchers to be part of these communities. "You have the network connecting you to the world at 622Mbit/sec. All you need to do now is show up," he said.[27]

GEOSPATIAL DATA VIEW

Another use of KAREN and other high-speed infrastructures into local authorities, government departments, and universities was likely to be the ongoing development of New Zealand's sustainability module for the international Digital Earth project.

The ability to zero in on a town or street on a Web-based digital map of New Zealand and access historical, community, ecological, and other data could be of enormous value in literally mapping our digital past, present, and future. Wider access to detailed public domain maps of cities, regions, towns, lakes, rivers, forests, coastal areas, roads, streets, and resources, including environmental data, was anticipated.

New Zealand had been officially charged with building the 'sustainability' model for the rest of the world as part of the Digital Earth project. Auckland City councillor and Digital Earth evangelist Richard Simpson wanted government and private sector holders of critical 'non-sensitive' map-based data to place this in the public domain as part of Digital New Zealand and the sustainability model.

Part of the solution was included in the Geospatial Information Strategy (GIS) approved in April 2007 as part of the e-government strategy, which itself had hooks into the Digital Strategy. It

was designed 'to improve knowledge about and access to assets owned, maintained and used by the government.' It set out to co-ordinate and direct the way geospatial resources were developed and managed, ensuring compatibility and reducing duplication and fragmentation of effort. It recognised the government's increasing reliance on such data for a wide range of activities from emergency services and national defence to utilities, resource management, biosecurity, and economic development.

The GIS would help ensure geographical information system databases, plus the various maps, land records, and related information provided to the public by government agencies and the private sector, were authoritative and up to date. A Geospatial Office hosted by LINZ was to be established. LINZ had the job of building and co-ordinating the model for public domain data; the Digital Earth Society would be a kind of watchdog to ensure this was done in an open way that enabled new stewardship models.

Simpson said dialogue to get different government agencies on board was ongoing and while the Geospatial Strategy was a step forward, it was still very much under the umbrella of LINZ, which was looking at it in the old way rather than with the new approach. The silo mentality about ownership and control of data inherent in the old analogue culture was still a deterrent to success. The old top-down model was no longer the way to work. "Having bureaucracies structured to be stewards for data about the sustainability of places is ridiculous when you consider the sort of technology that is now bringing universities together and opening up data and expertise for peer review by people who may be world authorities in other places and can make suggestions on how to improve or change things."

There was a clear need to engage with private enterprise and have 'community collaboration,' rather than just focusing on government as the source of all data. Many larger nations were strongly engaged, and often had huge financial commitment from large corporations. "That makes it even more important for New Zealand to be seen to be getting on with the job and showing it can take the lead." Simpson was convinced the only real way to meaningfully manage data was to index it through a place, geospatially. "It's about getting access to information pertaining to sustainability of places; if you ever want to be a knowledge economy or an information society this is a fundamental thing. We're not there until we can get to this stage."

Digital Earth was about turning things upside down and could be quite radical in the way it opened things up, allowing transparency of governance – in effect delivering a whole new human right. That was one of the reasons Simpson was putting his energy behind Digital Auckland. "We need to show what we can do as a city, and start getting people on board who can deal with the tons of data the council is sitting on." Funding would be used for broadband, urban fibre network ducting and other projects to ensure multi-gigabit Ethernet achieve wireless access for everyone by 2010.

This was important said Simpson, in order to attract creative industries and investment. Concurrently, he said, there was a need for councils to sort out important data that related to land-based resources. "Basically we're awash with data and the challenge is, how do we open up the silos of council and other agencies?" Ideally, he said, infrastructure could be created so that it effectively became 'a geo-spatial data clearing house' to assist in the controversial proposal for a single Greater Auckland City embracing Auckland, North Shore, Manukau, and Waitakere.

Simpson insisted the one-city approach was a no-brainer. "It's just ridiculous the way that it's divided up, it's in a dysfunctional state, we need to bring it all together, and the way to achieve that is to get the information working seamlessly." There was an urgent need to come up with a common vision everyone could buy into, and Digital Earth provided that sort of framework. "There's this big global vision, but you're not ever going to get there unless you can get a city working together, and obviously if we can get this city working together and take it beyond we can start getting New Zealand working together."[28]

PRIVATE FIBRE GROWTH

While KAREN was finally allowing the country's science, research, and academic institutions to catch up on high-bandwidth research and collaboration, the private sector had not been slacking. A growing number of examples of communities and independent network providers were co-operating to deliver high-speed fibre networks, among them, those that had received seed funding from the government's MUSH and Broadband Challenge funds which encouraged development of open networks.

Murray Young, senior consultant with Teleconsultants, believed LLU had become a distraction from addressing the nation's more important infrastructure needs. While LLU might break Telecom's monopoly over the telephone lines and was an important step to increase competition, it would not deliver the broadband speed New Zealanders required for real economic growth. The present infrastructure using phone lines and limited fibre-optic cable was simply too slow or too limited in geographic coverage to provide real broadband to a significant proportion of the population.

"It's a chicken and egg situation. Without the infrastructure we can't provide the applications like telephony, video, pay TV and gaming that drive the mass markets. Without the mass markets there isn't a business case to drive the investment in infrastructure. LLU and ADSL2, important as they are, distract from the fact that this is required now. The current network model with a main telco owning the infrastructure, with other players renting access and services for resale to end customers, will not deliver the speeds we need," said Young.

The alternative model emerging around the world was open access networks (OANs). These networks were owned by an independent body, usually comprising local government and community organisations. Simple economics of shared costs applied, with the efficiency gained by building only one network and a common technology platform for use by all service providers. The OAN model may even be viable in rural areas where traditional telcos and ISPs may have been reluctant to offer their services. While the model was still in its infancy in New Zealand, Young said there had been uptake, particularly in education and government sectors, and it could easily be extended to business and residential customers.

Examples included the Hamilton Urban Fibre Network (UFN), a collaborative project led by Hamilton City Council with support from Wintec, Environment Waikato, the University of Waikato, Waikato DHB, and private partner Lite Up. Funding was being used to develop a publicly owned broadband infrastructure available to any party within the network coverage area, with important links between the key partners involved with the project. "New Zealand's digital future cannot be left to the telcos alone to decide. Broadband is an enabler, vital to the economic development of local and regional areas. Councils need to be developing specific broadband business plans to ensure that their areas get the best bang for their broadband buck," said Young.[29]

ANOTHER JEWEL FROM THE CROWN

In 1995 IRL began to realise it had another asset in the former DSIR Network Operations Group, besides the ACE routers unit which had been spun-off and sold to Network Dynamics.

The Network Operations Group formed the nucleus of a commercially viable network service provider with considerable experience in the deployment, remote monitoring, and management of WANs, derived from work with the DSIR's network and the CRI network.

The decision was made to commercialise the business and seek

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customers in both state and corporate sectors. "After all, the CRI network connected more than 45 sites around New Zealand with more than 2400 users," said IT manager Dr Peter Whimp. There was some debate about establishing a consumer-grade dial-up service but technical staff resisted, knowing there were no systems or processes in place to handle this. Besides, customer interaction and help desk services would be extremely labour intensive.

IRL decided to acquire one of its existing customers, a small Auckland ISP called Internet Connectivity Associates (INCA), which had the systems and competencies to handle a large number of dial-up customers. In March 1996 IRL purchased INCAnet and formed Comnet Technologies, rolling into the mix an electronics development group from Christchurch and the IRL Server Operations Group, specialising in applications support.

Comnet Technologies grew rapidly, taking on commercial customers in both the WAN and desktop support areas, as well as dial-up customers and bespoke software development. The Christchurch electronics group became involved in the development of pager-based electricity load-shedding devices and networked meter-reading units. Then IRL merged Comnet Technologies back into the fold as Comnet Networks.

In June 2004 IRL decided such external commercial activities were no longer core business. Comnet was to concentrate on providing IT services within IRL alone. Clearly, for the Network Operations Group, this meant either abandoning close to 30 years of involvement with New Zealand's communications and Internet growth or exploring an alternative solution such as sale to a third party. On 1 October 2004 entrepreneurial independent bandwidth provider FX Networks acquired the assets and customers of IRL's Network Operations Group, as well as three key staff members, including Dr Peter Whimp.

The arrival of alternative long-haul backbone from independent dark fibre services provider FX Networks from September 2006 elicited a sigh of relief from a number of businesses and government departments who were looking at ways of saving money on big bandwidth. FX Networks had made an initial investment of $14 million in its Auckland-Wellington backbone, and was offering high-speed services through its own ISP, the former CRI-owned Comnet, which it had acquired in 2004.

FX Networks had cobbled together its own gigabit-speed nationwide network through investment and partnerships with carrier class operations, including pioneering CityLink in Wellington, which had its own 'open access' dark fibre. FX Networks owned 500km of the fibre in its backbone; a third of which was fibre leased from Ontrack, owner and manager of New Zealand's railway infrastructure, and the balance from Kordia and Vector Communications. The company offered IP telephony exchange services and peering for other Internet providers and businesses. The urban network providers could buy long-haul capacity directly or through any of FX Network's other partners.

FX Networks won the contract for the GSN national backbone and ISP services, and was delivering uncapped dedicated speeds between 100Mbit/sec–20Gbit/sec to strategic top 100 clients. Chief executive Murray Jurgeleit said once businesses were aware they could have this kind of bandwidth they began to do things very differently from when they felt constrained

IPv6 workshop. (Left to right) Faraz Shamim from Cisco, Gaurab Raj Upadhaya from Packet Clearing House (PCH), REANNZ CEO Donald Clark, and InternetNZ executive director Keith Davidson.

by the Telecom mentality. "If we give them attractively priced big pipe they start to rethink their data centre operations. 'Do we need five processing centres around the country or only two?' And 'how can we do a better job of disaster recovery?' They begin to change the way they think about structuring their hosting and applications to very good effect at times."

FX Networks was also the first network aggregator for KAREN, making advanced networking much simpler for some of its customers. "The challenges of managing the complex router configurations required for a core KAREN connection can be overwhelming for some of our members," said KAREN chief executive Donald Clark. Accredited network aggregator services would allow more people to experience KAREN as an enabler of their research, education, and innovation capabilities. In June 2007 FX Networks announced it would be spending a further $40 million over the next 18 months extending its private fibre-optic network to provincial centres and to Christchurch.[30]

In November 2006 state-owned Kordia, the re-branded BCL and THL Group, was actively engaging in alliances that leveraged its nationwide wired and wireless backbone capacity. It wanted to go much further than delivering competitive back haul and 'inter-metro capacity' for ISPs and new market entrants. Kordia had both fibre-optic cabling and digital microwave radio (DMR) capacity, enabling it to deliver broadband wireless access and a nationwide IP NGN, in direct competition with Telecom. However, Telecom, Vodafone, and TelstraClear and a number of second-tier carriers were also among its customers. One of the advantages of its wholesale 'application-aware' IPNetwork was that it could transport Ethernet or IP traffic with strict QoS and performance guarantees. In fact the greatest demand for its back-haul services was for VoIP and video.

Kordia's $24.3 million acquisition of entrepreneurial ISP Orcon, in the midst of a $30 million upgrade of its technology to provide QoS-based services for clients, raised a few eyebrows in July 2007. Would Kordia be used by the government to broaden urban fibre network coverage and help education, health, and local authorities achieve their goals of nationwide interconnectivity? Was the government now getting into retail ISP services? Would Kordia use Orcon's leading-edge network technology, geared for video-on-demand and IPTV, to give TVNZ a leg-up in the Internet game? Would Kordia be privatised?

Another wild card in the mix was government-owned Transpower, which operates the national high-power electricity transmission grid, and was in the midst of a major upgrade of its 500,000km fibre-optic communications network. It had been largely dependent on optical ground wire strung along the top of its towers to meet its communications needs but was engaged in a five-year, 44-project strategy to bring its technology into the 21st century. Performance from the new communications network, depending on the need, would range from 128kbit/sec to 155Mbit/sec with peak capacity greater than 2Gbit/sec. It had existing fibre from the top of the South Island down to Christchurch and would lease dark fibre to infill where required.

"Most of our fibre builds are down the side of the road because we don't have land owner

or easement issues. What is very interesting is that so many other companies and utilities are also investing in their own fibre routes. We are working with multiple parties to share that infrastructure so that we can deploy the most cost-effective solution," said Jim Tocher, Transpower's general manager of IT.

Transpower was partnering with various local and regional councils and utilities, with Alcatel-Lucent providing the architecture and overall management capability of the network. "I think there is an opportunity across New Zealand for parties to aggregate the capabilities for multiple providers. I don't see us going out there and selling or buying back a great deal of bandwidth. It's not our core business, but it is advantageous to us that there is effective infrastructure in place and we can get access to continued investment by others, as well as ourselves."[31]

The thought of state-owned and independent back-haul networks linking arms with the urban fibre and MUSH roll-outs opened up a world of possibilities. For true national coverage however, Telecom always had to figure in the equation. Although the landscape was about to change significantly once the 'devilish details' of the Telecommunications Amendment Act were cemented, and it became clearer what shape the country's main carrier might be in once the re-regulation engineers had unbundled it.

URBAN FIBRE OPENS UP

The profit imperative of mainstream telecommunications carriers hadn't exactly inspired local authorities to develop 'public good' services, so three lower North Island cities joined with private investors to build their own open infrastructure. Smartlinx3, owned by six private investors with shareholding from Hutt City, Porirua, and Upper Hutt, began rolling-out a mix of wireless and wire line broadband connections.

The councils, each contributing $250,000, needed high-speed circuits to handle huge two-way data flows for increasingly sophisticated applications. The shared network would be used for Internet access, IP telephony, videoconferencing, private networks, and data links for disaster recovery. "If you check out the typical price of a 2Mbit/sec frame relay circuit or a 10Mbit/sec connection it is a ridiculous sum of money … There are so many applications such as public security, where cameras need extreme broadband but if you look at this from a purely commercial imperative you'll never have them. There has to be a strong community interest," said Smartlinx3 director Prashanta Mukherjee.[32]

The Smartlinx3 open infrastructure initiative was a similar model to Wellington's CityLink, which got off the ground in the mid-1990s, driven by the WCC and a number of commercial partners. That network delivered independent open fibre access to businesses, government departments, ISPs and local authorities at increments from 10/100Mbit/sec through to gigabit speeds. It also provided a peering exchange for around 20 ISPs that were resellers for its connections. Among its clients were those who used real-time videoconferencing, the health sector, which moved X-rays between specialists and the printing and film industries, which needed to share large files.

EXTENDING THE BORDERS

The Broadband Challenge, where the government contributed $24 million

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to urban fibre network projects, was launched in Lower Hutt on 27 November 2006. It recognised the work done by the Smartlinx3 project and contributed to extending the network. Other projects receiving funding included Canterbury Development Corporation, North Shore City in association with Vector Communications, Hamilton City Council, and Nelson Marlborough Info-region. Successful rural and under-served applicants were Waitakere City Council, combined with the Wikarekare Trust, West Coast Development Trust, Waikato 2020 Communications Trust, and the Tuhoe Education Authority.[33]

Vector Communications had open access fibre-optic networks in Auckland and Wellington and was expanding its coverage, particularly on Auckland's North Shore. Its network was being used as back haul for Vodafone and a number of commercial organisations including ISPs Orcon, Ihug, CallPlus, Iconz, QuickSilver, and Maxnet. It was to have begun work on its extension project in late 2006, but a row with the Commerce Commission forced it to freeze the contact with equipment supplier Ericsson. The stalled $6 million-plus Broadband Challenge project was underway again in February.

Vector received $4.6 million from government coffers to roll out 38km of fibre, which would pass 45 schools, 6 libraries and council facilities, hospitals, and businesses on its route.[34]

The project, known as the North Shore Educational Access Loop (Neal), was finally launched in April 2007 with the goal of delivering gigabit speed connections.

Meanwhile Waitakere City was forming partnerships with TelstraClear, Telecom, Vector, Vodafone, and Kordia (formerly BCL) to build its own open access fibre network. Urban fibre networks had also been developed in Christchurch, Nelson-Marlborough, the South Island's West Coast, and other under-served areas – often involving wireless and DSL technology – where Telecom was a major partner.

DUCT SHOOTING SEASON

James Watts, managing director of Palmerston North's Inspired Networks, first saw the opportunity to establish an independent fibre network in 2002. He got alongside every utility company that had plans to dig up any significant roadside area and convinced them to put his ducting in the ground. At the beginning of 2007 Inspired had circled the inner city with fibre as part of its MetroLAN meshed city-wide network, servicing dozens of buildings and wholesaling 10–100Mbit/sec and gigabit or dark fibre connectivity. The company was willing to make its open fibre back-haul resources available for anyone wanting to bring DSL to the Manawatu. Watts was hopeful a wholesaling or naked DSL arrangement with Telecom would get his company into each home and businesses with new services.[35]

In March Wellington City councillors were briefed on a plan to deliver high-speed broadband to every household. The proposal called for the city's assets to be made available at no cost to private ISPs, to lay out the fibre-optic cable for high-speed broadband. The first stage would see 100km of fibre-optic cable strung across the city's network of trolley bus wires, which was expected to reduce cabling costs by about 80 percent and cost $10 million–$30 million. In the final stage connections to homes, business, and schools would be completed using copper, wireless, or cable at a cost of $5 million–$10 million.[36]

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The council agreed to the vision that could deliver affordable high-speed broadband Internet access to Wellington city by 2012. The plan was expected to improve economic development through employment growth, new business creation, and attracting and retaining businesses. It was also seen as being good for education by connecting schools to videoconferencing, enabling more people to work from home and would be useful for entertainment including HDTV.[37]

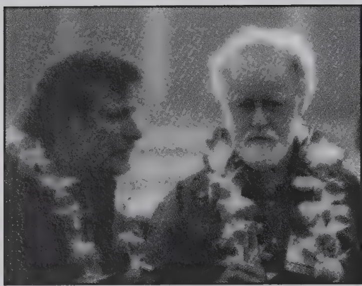
However, Wellington Mayor Kerry Prendergast was disappointed; despite 24 telecommunications firms showing interest in the project none wanted to take advantage of the offer of free access to the city's sewers, water pipes, and other infrastructure in return for laying more fibre. That left the council seeking government input or a rating levy to complete the first stage. The $40 million, two-stage plan aimed to lay fibre in council ducts and on trolley bus pylons to link schools, libraries, and hospitals and then move on to all suburbs. A third stage would see an even wider deployment of fibre.[38]

Meanwhile our growing dependence on broadband networks was illustrated graphically by the outcry after Wellington's independent CityLink network crashed on 6 October 2007, sparking a city-wide Internet failure and disrupting services in other parts of the country. The outage left disgruntled TAB customers flooding the services helpline with complaints. TradeMe clients were cut off mid-bid with the volume of customers cut by a quarter and MetService subscribers were unable to track weather information for six hours.

CityLink worked all day to resolve the issue but even weeks later was claiming it had no idea of the cause. Fortunately the crash occurred on a Saturday when the bulk of businesses weren't reliant on being on-line. Citylink provided exchange services for ISPs around the country and the crash would have had an impact on the routing of their traffic.[39]

Perhaps the outage was part of the growing pains as broadband initiatives were springing up around the country and more and more pressure was being brought to bear on existing infrastructure. John Hine, head of the School of Mathematics and Computer Science at Victoria University, was pleased there was finally some serious pressure for 'real' broadband. "People are recognising that 256kbit/sec or basic ADSL, which has been marketed for five years now, is really the very bottom line of broadband and the telcos are being pressured by new competition to push things forward. However, I remain disappointed that when you compare us with most developed countries we are still well behind."

He believed the success of open fibre networks would help alert the country to the true worth of broadband. "We're going to find that KAREN and some of the MUSH and loop projects will show people what real bandwidth can do. Small businesses will want it and we'll end up going through another cycle of demand. We got into the situation in the 1990s where our bandwidth wasn't increasing at a rate that matched the rest of the world, but that had a lot to do with people not seeing what could be done and therefore not asking for it. As soon as you start to get some of these fast networks around; and people may start to see this in some of our schools first, then they will start to think about how they can use it and the demand will be there."



Internet pioneers. Frank March and Neil James, former chair of the NGI-NZ Group at the TUANZ Broadband Reloaded gathering in Hastings in 2004. TUANZ Archive

OPEN GROUND CONSIDERED

The commercial carriers wanted secure anchor tenants before getting involved in fibre roll-out, so the Digital Strategy group tried to raise the awareness of prospective clients to improve the business case for aggregating network infrastructure. Former Digital Strategy chief Peter Macaulay believed there was common ground that should be explored across government-owned networks; Kordia, KAREN, health, education, and the urban fibre networks.

If the proposed health and education networks agreed to work together this would create sufficient demand to put fibre into under-served areas, and deliver 'cash flow potential' for network investors based on a five-year projection. "This is not about technology but forging relationships across organisations to ensure everything works together, it also creates an opportunity for major suppliers who haven't got fibre between points A and B, to capitalise that with guaranteed business."

A good catalyst was the informal Five Networks group, established at the end of 2005 and chaired by Internet pioneer Dr Frank March, a specialist advisor within the MED. The loose affiliation of interested parties within various government agencies was keen to ensure wider collaboration of high-speed state-owned network resources. It was clear the GSN and the KAREN advanced network were dependent on last mile fibre to get to some of their users. These were often the same kinds of customers the Broadband Challenge urban networks needed to get to. "In a way it was a marriage made in heaven," said March.

A meeting of the three networks was called to discuss neutral peering points to ensure all the networks could interconnect. "While KAREN was restricted in that it couldn't carry commercial traffic, it could still run over the same physical infrastructure, so we made sure everyone was in the same space." Health sector IT planners who were looking to establishing a national health infrastructure were invited to a second meeting and then education joined, making up the Five Networks. "We were essentially a non-executive body that was comparing notes, and playing a co-ordinating role as required. The danger was that people planning away in their own patch weren't cognisant of what others were planning. Education and health were reliant on a common infrastructure and that's why we quickly got this level of collaboration," said March.

By mid-2007, however, Cabinet sought a more formalised approach and decided the small gathering of IT gurus wasn't appropriate and co-ordination would be better under the wing of the SSC, which already had responsibility for the GSN.

TELECOM SEES THE LIGHT

Telecom wasn't going to be daunted by the free-for-all battle around its unbundled network. It was preparing its own armoury for an aggressive counter to meet competitors head-on when the NGNit had been talking about for several years began to take over.

Telecom began rolling out ADSL2+ to customers in the main cities from mid-2006. It would upgrade its network, place its equipment in street cabinets

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closer to user communities rather than telephone exchanges, shorten the copper loops, and take fibre closer to the home.

Speed was not the main driver for Telecom; it was simply more economical to deploy DSL2+. "Customers within a kilometre of DSL2+-equipped exchanges would find their service 'screams along'; beyond 3km they were unlikely to notice any difference," said Telecom's group technology officer, Greg Patchell. While ADSL2+ was capable of peak speeds of 24Mbit/sec, few customers were likely to experience that. Telecom estimated that 75 percent of customer lines were capable of speeds of more than 6Mbit/sec, and only 65 percent could handle more than 8Mbit/sec.

The big shift for Telecom, however, was fibre. All new subdivisions since 1996 had cabinets installed that could be upgraded for fibre, and from December 2007 Telecom would no longer deploy copper in new suburbs – it would be fibre all the way to the premises. "Putting a piece of glass in ground is now the same price as copper and it doesn't require a DSLAM. The economics are reasonable so it's sensible to do this now." Patchell doubted there would ever be a business case to overbuild copper with fibre in most suburbs, although fibre was "looking pretty attractive right now."

FTTH was already a reality, certainly for the new Manukau suburb of Flatbush and a new Auckland subdivision beside the Mt Wellington Quarry, where 600 homes would be completed by the end of 2009. Using the latest gigabit passive optical network (GPON) technology, fibre would be laid from the Remuera exchange to the greenfields housing area. GPON street cabinets, where light waves were passively split into strands to service individual homes, were just over a metre high and allowed fibre to be located up to 60km from an exchange without electronics, as opposed to copper, where the optimum length was 800 metres. "That's where there's a huge saving over DSL. It changes the landscape of the industry and what carriers and retailers are able to do."

New homeowners in the Mt Wellington subdivision could expect initial broadband speeds of 24–25Mbit/sec, although higher speeds might be achieved depending on switching technology in the exchange. Subdivisions under development in Christchurch and Queenstown were also likely to benefit from GPON technology. In fact Telecom was busy taking fibre to as many cabinets as it could around the country, initially in the five main city areas, as well as shortening the length of copper to improve performance.

The future might, however, improve on the 60km limit. Telecom was working on amplified GPON in experiments with New Zealand's collaborative research and development company Media Lab, Auckland University, and British Telecom's laboratories in Suffolk. Huge R&D was going into eliminating powered electronics in access networks in order to provide better and more cost-effective service, including WPON equipment from South Korean researchers, which passively splits multiple wavelengths of light as they travel down fibre, further reducing the electronics required in roadside cabinets for delivery of high-speed broadband.

Meanwhile in October the Commerce Commission was taking another look at the terms on which Telecom was to open up its roadside cabinets to competitors. While fibre to

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the curb would improve the performance of the broadband network, 'cabinetising' Telecom's network or taking FTTN could cause difficulties for its competitors. If rivals located equipment in Telecom exchanges and Telecom moved cabinets closer to the premises, equipment might have to be moved or written-off and the investment wasted. There was also a concern about the economics of such as move, while smaller cabinets provided better performance they also served less people.

Commerce Commission telecommunications director Osmond Borthwick said there was tension between rolling-out FTTN and local loop unbundling. "As well as the investment puzzle, that is what a lot of overseas regulators are looking at – how do competitors survive that FTTN process and how does competition persist in the light of that investment pattern? … In a way it is a good problem to have if there is a lot of fibre being rolled out, but it does have some potential impacts on competition that we are sensitive to."[40]

PREPARING FOR IMPACT

New Zealand's slow Internet speeds were threatening to leave the nation out of the global economy, according to one of the founders of the Web, Larry Smarr, director of the Californian Institute for Telecommunications and Information Technology. He said New Zealand's speeds were "a baby's crawl compared to the spaceship" on the international scene where American, European, and Asian nations were rolling out fibre-optic cables directly to houses and businesses, creating super-fast networks that permitted high-end businesses to flourish.

At current speeds, it would only be a matter of time before New Zealand was left out of the tech-business loop. "We still think of the world as divided by land and ocean, but the Internet doesn't recognise these divisions. A country has to offer a better value proposition and it needs to make sure there aren't barriers – bandwidth is becoming that barrier," he said.[41]

Any plan for more widespread fibre-optic implementation needed more input and guidance from the government, because ultimately it would affect the country economically, socially, and in every other way. TUANZ chief executive Ernie Newman said converged communications technologies, like electricity and railroads, were a general purpose technology that impacted on not just how we live, but where we live. "Such a technology comes along rarely, probably less than once a generation. Broadband is the glue that delivers converged technologies to wherever they may be needed. In turn this enables an almost infinite range of added-value devices and services that revolutionise people's work and lifestyles."

Newman said he was waiting for the day when transport authorities realised that a few strands of fibre buried under a motorway to facilitate telecommuting and sophisticated traffic management came at a microscopic cost compared to constructing extra motorway lanes. "Factor in the rapidly increasing importance of environmental sustainability and carbon credits and you add yet another incredibly powerful argument for communications technology to be viewed as a direct substitute for transportation."

He warned against trivialising the impact of technology that brought us leisure and entertainment. "Life is not just about work; it's about learning, socialising and having fun. The next generation of entertainment will be highly focused on the telecommunications networks as a core delivery mechanism, giving all of us more choice of content and flexibility to use it on demand. International computer games are not to be scorned – many of our young people are using them as a very

powerful means to learn life skills and work skills. Anyway, leisure is an economic activity – your interactive video game can be my livelihood."[42]

NEXT LEVEL INTERNET

Simon Riley, a founder of NGI-NZ, the precursor to KAREN, said New Zealand needed to watch international developments and plan its own innovations because in all likelihood there would be a new Internet by 2012. "All the Obi-Wan Kenobis of the Internet community overseas have come to the same conclusion; the Internet is broken and it can't be fixed. You can't keep putting band aids on band aids, so they're saying, 'Knowing what we know now, what would we do if we had to start all over again with a blank page?'"

The Internet as we know it was doomed because of the ongoing challenges of security and the surge of video downloads. "If the next big driver for broadband is video or IPTV, then the reality is the current infrastructure cannot support it. If everyone starts downloading videos the whole global infrastructure will fall over."

Riley's apocalyptic views were supported by the November 2007 publication of a report from the Nemertes Research Group,[43] an independent US-based analysis firm that warned the Internet as we know it was heading for overload and ultimately brown-out unless backbone providers invested billions of dollars in new infrastructure.

It said a flood of new video and other Web content could overwhelm the Internet by 2010 unless backbone providers invested up to US$137 billion (NZ$182.5 billion) in new capacity – more than double their current intentions. "Our findings indicate that although core fibre and switching/routing resources will scale nicely to support virtually any conceivable user demand, Internet access infrastructure, specifically in North America, will likely cease to be adequate for supporting demand within the next three to five years," said the study. The Nemertes study suggested demand for Web applications such as streaming and interactive video, peer-to-peer file transfers and music downloads would accelerate, creating a demand for more capacity.[44]

Dozens of projects worldwide aspire to displace, replace, rework, or radically improve what we know as the Internet. Some believed incrementally adding to what is already there is sufficient: if it ain't broke why fix it? Others feared a breakage was imminent with all the fragile routing protocols, add-ons, updates, denial of service attacks, abuse from spammers, hackers, phishers, and other net nasties. The roadmap ahead would only add more complexity as a plethora of mobile devices, interactive applications, and Internet-enabled devices from phones, cars, home appliances, and RFID tags joined the rush to the Web.

The Internet is used by hundreds of millions of people daily and works well in many situations but it was designed for completely different assumptions, according to Dipankar Raychaudhuri, a Rutgers University professor overseeing three so-called 'clean slate' projects. "It's sort of a miracle that it continues to work well today." Even Vint Cerf, one of the Internet's founding fathers, had come out in support of the clean slate pioneers, saying a replacement for the Internet is needed because current technology cannot 'satisfy all needs.' Researchers believed a new network could run parallel with the current Internet and perhaps even one day replace it.

Internet2, led by the US research and education community since 1996, remained the foremost advanced networking consortium, with its partners pushing the envelope with new technologies and capabilities that could have a fundamental impact on the future. The not-for-profit advanced networking group comprised more than 200 US universities in co-operation with 70 leading corporations, 45 government agencies, laboratories, and higher learning institutions as well as more than 50 international partners.

Internet2 was undergoing a transformation to become faster and more flexible, even offering scientists temporary circuits on-demand. It was becoming a hybrid network, with an option to transfer data using the traditional packet switching approach or the new optical capabilities which enabled users to acquire dedicated bandwidth for a fixed period. The first stages of the upgraded Internet2 went live in August 2007.

"What the scientists want is bandwidth on demand," said William Johnston, manager of the Energy Department's Energy Sciences Network, known as ESnet. Physicists at laboratories worldwide can reserve a section of the network for several hours on a particular day to transfer massive data files from particle colliders or engage in bandwidth hungry collaboration projects. Researchers and administrators might use the on-demand circuits for transmitting detailed satellite imagery when natural disasters strike. For example the National Oceanic and Atmospheric Administration could open special lanes to transmit urgent data on tornado warnings. The Federal Emergency Management Agency might want access to a dedicated circuit in the aftermath of a hurricane to quickly transmit high-resolution satellite images of which neighborhood blocks need the most immediate help.

In the past, the whole Internet2 community shared one network which had huge capacity. Now the size of data has grown so much some users want their own networks. For example the Department of Energy's Energy Sciences Network (ESnet) was using the Internet2 infrastructure to build a faster, more reliable network, named ESnet4 which it described as "a quantum leap" ahead in supporting research community including analysis work with the Large Hadron Collider at CERN in Switzerland which goes into operation in 2008. By 2009 it was predicted, physicists would be sending a steady stream of 20Gbit/sec to the United States and researchers at universities and national laboratories would be exchanging files as large as 5Gb to 10Gb.[45]

In 2003, the NSF funded the '100x100 Clean Slate programme'[46] at CMU, Stanford, Rice, and FraserResearch, which had since developed novel approaches to network design, optical and wireless access networks, network control, and congestion control. This was expanded in 2006 through the Future Internet Network Design (FIND)[47] project. That work fed into efforts begun in 2005 when the NSF began to envision a framework that would enable US researchers to build and experiment with new designs and capabilities that would inform the creation of a 21st century Internet.

OUT OF THE BOTTLE

The next generation Internet would have built-in security and functionality to connect every kind of device. A means to experiment with and test some of those applications was the Global Environment for Networking Innovations (GENI) initiative.

Researchers needed to start thinking beyond the current Internet and consider radical new ideas for continuing challenges such as Internet security and ease of use, said David Clark, a senior research scientist in the Computer Science and Artificial Intelligence Laboratory at the Massachusetts Institute of Technology. "The US Department of Defence had been pushing for adoption of IPv6 to replace the widely used IPv4, but the GENI project would go years beyond the current vision for IPv6," said Clark, a long-time Internet security researcher who served as chief protocol architect for the US government's Internet development efforts during the 1980s. He hoped the GENI Initiative would envision the Internet society's needs 15 years ahead. It would deliver new core functionality for the Internet, including naming, addressing, and identity architectures; enhanced capabilities, including

additional security architecture, and a design for high availability and new Internet services and applications.[48]

In 2007 NSF researchers were working up the design for the new test environment and had contracted advanced technology solutions firm BBN Technologies – who had helped pioneer the original development of ARPANET – to serve as the GENI Project Office. "GENI will give scientists a clean slate on which to imagine a completely new Internet that will likely be materially different from that of today. We want to ensure that this next stage of transformation will be guided by the best possible network science, design, experimentation, and engineering," said principal investigator and project director Chip Elliott of BBN.

Meanwhile Stanford University was working on its own 'clean slate design' for the Internet in 2006. While complementary with GENI, it was to be funded by seven industrial sponsors, with researchers at the same location, enabling close collaboration across disciplines and among graduate students. It would bring together world-class researchers from several disciplines outside the traditional field of networking, including services, equipment, semiconductors, and applications, to deliver a broader, fresher perspective. Stanford researchers claimed the current Internet had "significant deficiencies that need to be solved before it could become a unified global communication infrastructure."

They didn't believe the shortcomings could be resolved by the conventional, incremental, and 'backward-compatible' style of academic and industrial networking research. Its proposal focused on 'unconventional, bold and long-term research that tried to break the network's ossification.' It wanted to try to visualise what the Internet would look like in 15 years and 'knowing what we know now,' figure out how to start again with a clean slate, and design a global communications infrastructure. The interdisciplinary research programme would create a loosely coupled breeding ground for new ideas in collaboration.[49]

Wamberto Vasconcelos, a lecturer in computing science at Aberdeen University, said he was sceptical about what was driving the push for a replacement for the Internet. "One of the key features of the Internet from its very beginnings was its anarchic approach. It has always grown organically – things that are good about it survive, while innovations that are not simply die off. If there was to be a wholesale replacement for the Internet I can see a great deal of interest and influence being brought to bear on it by major corporations such as Microsoft and IBM, not to mention the influence of government. Users – those who make the Internet what it is – could ultimately lose out. If major companies and government have more control over networks there would be better security, but the price users pay would be less privacy."[50] The clean slate programmes being run by prestigious universities including Princeton, Stanford, Rutgers, and the Massachusetts Institute of Technology, were not expected to bear fruit for at least another ten to 15 years.

In May 2006 Web inventor Tim Berners-Lee insisted the Internet should remain neutral, and efforts to fragment it into different services should be resisted. "Attempts in the United States to try to charge for different levels of on-line access Web were not 'part of the Internet model'," he said in an address to a conference in Edinburgh on the future of the web.

He warned that if the US decided to go ahead with a two-tier Internet, the network would enter a dark period. "There's one Web and anyone who tries to chop it into two will find that their piece looks very boring." Berners-Lee, director of the World Wide Web Consortium, believed in an open model, based on the concept of network neutrality, where everyone had the same level of access to the Web, and all data moving around the Web was treated equally.

The 'right' model was that any content provider could pay for a connection to the Internet and put any content on to the Web with no discrimination. Even co-inventor of the Internet Protocol Vint Cerf stated in 2006, "The Internet was designed with no gatekeepers over new content or services. A lightweight but enforceable neutrality rule is needed to ensure that the Internet continues to thrive."

WHERE THE MARKET DEMANDS

Dean Pemberton, senior technical specialist working on telco and enterprise networks and a long serving NZNOG member, suggested any changes to the Internet infrastructure in New Zealand would follow the old maxim of appearing first where there was sufficient market share and customer demand to justify investment.

"When people roll out these things they look at who they can sell it to and what the drivers are." For example the whole argument about IP4 versus IPv6 hadn't progressed much since 1991. "You still can't convince 90 percent of the Internet population to get interested. As long as people can get their rich media content over the systems that get used today then we're not going to see a push for anything new, no matter how cool it is. The minute there's a killer app, whether its media sharing or the new version of *World of Warcraft*, that only works with a particular change, then you can start to convince a whole lot of people to be on it."

The revised deadline for running out of IP4 addresses had been extended to 2010. The Japanese government and American Defence Department were mandating IPv6 support; the dot.nz registry was running it, as was the advanced KAREN network. And while a number of ISPs and carriers had been toying with it, there were no clearly stated benefits. "No one's asking for it and no one's building it into their systems. We've got sneakier. Rather than allocating more addresses we've found ways around it, and perhaps in the future we'll come up with NAT2 (network address translation version 2) to better handle what we've already got. We have learned from some of our mistakes and in other cases we haven't: some ISPs are still allocating 16 million IPv6 addresses for every user, so we're still wasting these things."

Pemberton said we would be remiss if we didn't keep an eye on international advanced network developments to ensure we weren't slipping behind or heading in a different direction. "We need to make sure we're current with what is going on in the rest of the world but also acknowledge that New Zealand has a unique position in the market and our own innovations may well provide the answers we need."

It's easier to roll out for four million people than 20 million in the United States; New Zealand had been used as a technology incubator in the past for things like Eftpos systems and barcode scanners in supermarkets, he said. "We're doing all we can but we're a slave to the 'tyranny of distance' as the old Split Enz song goes; we're at the end of a big wet piece of glass and nothing will change that. Most of the content we access, including emails and Web traffic, originates from outside New Zealand and the economics of that mean we're not going to be able to enjoy some of the technologies that get used."

Meanwhile, there were no clear winners in the next generation Internet stakes. "They all have amazing potential but they're yet to show this. While we have KAREN, you have to remember that's not the Internet in New Zealand, the commodity Internet here is what my mum and dad dial up to." The logical thing would be to find out how advances in Internet2 relate to what New Zealanders are doing and applying small changes incrementally. "Look at the Web 2.0 applications which were born from company portals and are now being used in portals for end users. These lend themselves to our environment very well while we're still waiting for the roll-out of high-speed broadband," said Pemberton.

SWEDISH ROUNDING

While there were major changes going on in relation to the next generation Internet, Peter Macaulay, who was elected president of the InternetNZ lobby group in July 2007, believed the greatest value for New Zealand would come from Europe. "In the US there's such legislative backlog, they've become anally retentive with their own pockets of innovation being attacked by local telcos who claims this is unfair competition." If we take the best of what's coming out of the world, New Zealand may yet become a WCL, he said.

Simon Riley also believed New Zealand had to plan its own way forward. "Generally speaking any municipally driven broadband initiative in the US, whether it's wi-fi or fibre, has been attacked not only by telcos but 'astro turf' organisations; fake 'grass roots' lobby groups, think tanks, and business organisations often backed by telcos, who say broadband roll-out should be left to the marketplace and not involve taxpayers' money." He said smaller locations were more compatible with the New Zealand experience, including Canada and Sweden, where the political environment was more sympathetic to government intervention and there was usually an incumbent and a couple of competing players.

"I think we can create our own models but based on parallel developments; for example, in Sweden the Urban Network Association (SUNA) said in 2000 that they would have optical fibre throughout the country in five years, and they've pretty well done it, offering 100Mbit/sec in some places." It was Sweden's success that prompted Riley, who organised the Digital Cities Conference in Wellington in November 2005, to invite Lars Hedberg, secretary general, founder and former chairman of SUNA, to be a keynote speaker. Unfortunately a conflict in schedules meant he had to make the presentation by broadband video, but he nonetheless got his point across.

Hedberg said, once the European Union allowed competition, municipalities started looking into costs and found they could save a lot of money by laying their own cables. The move in Sweden – population eight million – kicked off when many municipalities, which also happened to own power companies, began to lay fibre whenever they dug up the streets for electrical cables. Local businesses began asking if they could have access to connect their offices to storehouses and on it went.

Of the 290 communities in Sweden, about 200 had an OAN in 2005, where anyone could lease dark fibre on equal terms. These networks served schools, health care centres and local councils as well as widely scattered groups of small islands and areas of low population density. Open access was defined as networks 'where the network owner doesn't compete with the service provider.' According to Riley, Sweden initially set the bar at 50Mbit/sec for OANs, and was now lifting the bar to 150Mbit/sec.

BIG, HAIRY, AUDACIOUS PLAN

If the government could pull together enough momentum and resources to launch a gigabit shared network for its departments and agencies (GSN) and an advanced science and education network (KAREN), there must be hope for other big pipe projects. Health and Education, for example, were certainly hoping to leverage this kind of collaboration. Extending Probe beyond 512kbit/sec and filling the rural and remote gaps would no doubt be a priority for Digital Strategy V 2.0, as would extending the reach of the urban fibre networks.

However, TelstraClear chief executive Allan Freeth seemed concerned that all the open access networking, both with and without government assistance, was cutting into his company's potential market share. He told a Wellington Chamber of Commerce breakfast in mid-August of his fears about the 'headlong rush' into broadband network investment by some city councils, including WCC which planned to spend $40 million to build a 100km broadband network. With many councils holding the vision of affordable high-speed connectivity for all, the definition of affordable, and the question of subsidies, capital investment and who would pay needed to be fully considered, he said.

Dr Freeth said local authorities in particular needed to understand how their local economies could potentially benefit from their investment in high-speed broadband, and how fibre-optic networks would be used and funded. "People think you build the network and that's it. These

networks are very sophisticated, large-scale computer networks with all the problems of software." Maintaining and upgrading TelstraClear's network cost $100 million–$150 million a year. Telecom's soon-to-be-unbundled copper loop network would finally allow telecommunications companies wide access to New Zealand communities, but Telecom's 'restricted' investment in the network meant consumers would not get the speeds they required. The answer, he said, was a fibre network running at least to customers' kerbsides at a cost of more than $1 billion, but both main carriers faced the reality that network investment needed to provide the certainty of returns expected by company shareholders.

"High-speed connectivity will allow us to do many things but installing a broadband connection does not make people innovative, it does not in itself throw up new ideas and does not automatically mean more GDP, " said Freeth. Maximising the economic potential of broadband required the development of a 'cultural change' and start-up incubators to foster the new ideas that would translate into new products and services.[51]

However InternetNZ's Pete Macaulay said open access networks needn't be complex or difficult to deploy or manage. "You keep the advanced stuff simple and accessible but you need adequate capacity. If you don't have the capacity it becomes hugely complex with technical solutions like deep packet inspection required to run the network. If we can avoid getting into that end, by having sufficient local capacity, then everything is faster, better and less expensive and robust enough to have multiple paths so you can run anything across it."

He was determined to push forward with what he called his 'big, hairy, audacious plans' for pervasive open access fibre-optic networks. That access depended on having a big enough pipe into neutral peering points around the country. He would be watching with interest now nearly everyone, except TelstraClear, was back in the peering game. Telecom's change of behaviour meant there was a greater willingness to achieve common goals for broadband interconnectivity than ever before.

"We need to give Telecom credit for its 29 points of peering which will enable the fundamental principal of keeping local traffic local. You can't do high-speed networking for entertainment or HDTV without it. If you have several thousand users trying to access an HDTV server in the US it would swamp the Southern Cross cable. However if you send it down one time, and give people access off local servers, there's no problem. You end up with a regional servers handling high volume content for local communities."

BANKING ON BROADBAND

Macaulay continued to ride his personal hobby horse that pervasive broadband would be dramatically assisted by the creation of a 'broadband bank' to encourage investors to build more open fibre networks. He was positively evangelical about the wider impact of his model, which he called the 'lily pad effect,' which, with the right cash injection, could connect open fibre networks across the country.

"If you build back-haul capacity in all the cities and towns the next thing you know it's only 10km to join them together – suddenly the whole of New Zealand joins up. We don't have to have a huge amount more back-haul fibre to do that." What was needed, he said, was for Telecom and other commercial carriers to realise the future was not based around operating in a 'walled garden.' "If you connect everything up there's room for everyone to have a share of the traffic."

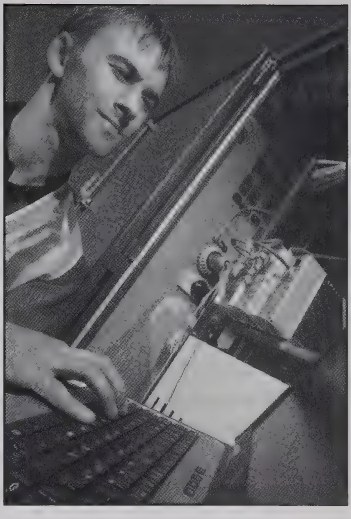
New Zealand was languishing because of lack of connection and Telecom was failing to deliver what the country required. The Broadband Challenge fund encouraged fibre build-out, but only $24 million was set aside for the six successful networks. More needed to be done, preferably through a government-facilitated fibre fund. "I'd like to see pilots for fibre to the home initiatives. This is an absolute key to getting everything working. As you get the entertainment flows to the home it will

create the demand and funding for major back-haul changes, creating an entire feed-back loop."

Macaulay was lobbying for around $250 million to kick off what he hoped could become a $1.75 billion investment repository. Funding would come from banks and other financial institutions. Anyone could apply for funds to build a network as long as it was open for anyone to use. He was keen to see some kind of policy to streamline resource consents to lay fibre, and encouraged co-operation between carriers and utility organisations to notify each other when there were roadworks, so ducting or additional cabling could be added.

"The Resource Management Act makes it very difficult to lay fibre. We need to get people to understand that fibre is inert; when you cut it, it doesn't make sparks, it doesn't pump smelly stuff all over the place." It's important, he said, to get councils to understand their role in this community-owned infrastructure because it's a natural monopoly and also allows commercial organisations to share fibre or run their own. He had no objection to Telecom taking advantage of any future fund as long as the cable and the conduit was open to everyone.

The goal was to roll out fibre to 85 percent of the population, enabling up to 20Mbit/sec access. The above ground component – the routers, switches, software, and operational stuff – was normal commercial-risk equipment with a three-to-five-year life. The big investment was needed in 'long-life, low-latency, low-risk underground community-owned infrastructure.' The MED distanced itself from the proposal in 2006 as did David Cunliffe, but knowing Macaulay's determination and his lobbying influence it would be back on the agenda at every opportunity.



Bolstering bandwidth. Jason Munns, Transfield Services Telecommunications inside plant designer, testing Telecom broadband connections in an Auckland residential development. Photo: Telecom

WHAT'S A FEW BILLION?

InternetNZ chief executive Keith Davidson believed the attitude preventing more rapid roll-out of fibre, could be traced right back to the 'bad old days' when Telecom was telling people they didn't need broadband. "The community was very upset by this. Then we had Project Probe and – surprise, surprise – Telecom got to provide its broadband solutions in 14 of the 18 regions. In other words the government paid Telecom to install its equipment, so Telecom could continue to overcharge for its not very useful broadband product."

And he said New Zealanders were kidding themselves if they believed 'broadband' was Telecom offering us some version of DSL. "Until we have people committed to the concept of fibre to the home, we won't have a usable network for the sorts of things the future holds. If we had gigabit fibre, Sky TV and other digital services could be delivered without impacting anything else. There has to be a more robust method of delivering TV than having your signal disappear every time it rains." He suggested an investment of $5 billion to get fibre to all New Zealand homes would still be peanuts compared to what could be achieved with it. "If we endorse broadband and technology we stand to increase our GDP hugely, and if we don't do anything we stand to suffer in GDP terms. We can either go backwards or forwards."

DAMNING REPORT CARD

New Zealand would not be capable of meeting mass market technological needs in the near future unless significant investment was made across all networks to ensure our capability matched that being built by OECD leaders.

The September 'Connecting to Our Digital Future'[52] report warned that broadband diffusion needed to be accelerated or New Zealand would increasingly struggle to trade in infrastructure-based markets. The report, commissioned by the HiGrowth Project Trust and the New Zealand Council for Infrastructure Development (NZCID), said plans to make it to the top quarter of the OECD broadband numbers by the extended deadline of 2015 needed to be ramped up considerably.

NZCID chief executive officer Stephen Selwood said international trends showed that within seven years, technology, research, film, medical, and financial services industries would require public data speeds of 100Mbit/sec, with gigabit speeds following closely behind. This would require a change in our current thinking and a substantial lift in investment.

"We may even be excluded from some markets if our trading partners insist on the use of advanced services," said the report. The estimated $10 billion required to provide fibre to 97 percent of New Zealand properties was a small price to pay when considering the growth it would bring to GDP.[53]

FREE UP THE FIBRE

The study, conducted by AVA Consulting in conjunction with HiGrowth and the NZCID, with data gathered from 100 ICT industry leaders, claimed wireless technologies were not capable of meeting mass market demands for 100Mbit/s or 1Gbit/sec public access speeds within the 2015 timeframe. Wireless networks were considered to be little better than 'infill' technologies where fibre and copper did not reach.

It concluded that New Zealand needed to facilitate competition and deliver prices comparable to those in leading OECD countries. Territorial authorities should be encouraged to allow micro trenching in road shoulders for the development of fibre networks and Telecom's competitors should be allowed access to the incumbent's manholes and ducts. It also recommended unbundling of fibre to the curb to allow Telecom's competitors access to fibre.

Significant issues with performance and coverage of existing fixed networks included a lack of fibre and reliance on ageing copper cables. Performance of some long-haul networks, as well as regional back-haul networks and a lack of regional back-haul capacity were highlighted. Higher prices were paid for services in general and mobile in particular, than in other OECD countries. DSL broadband services delivered less than could be obtained for similar prices in other OECD countries.

"In order to be comparable with leading countries in ICT capability, New Zealand will, by 2016, need to have fibre very close to the home if not into the home. Initial aims should include fibre to the business in all main CBDs and commercial and industrial areas, increasing fibre to the node penetration in residential areas and fibre to the home where practical, most likely in greenfields developments."[54]

Infrastructure investment could be speeded up by letting rival firms bury fibre-optic cables in shallow trenches rather than forcing them to dig deep ones. Selwood said it might

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cost between $1 billion and $2 billion to connect Telecom's cabinets with fibre and the price tag for providing fibre connections directly to 97 percent of homes might be $10 billion.

However "the cost of not accelerating broadband diffusion would result in forgoing increases in economic growth many times the cost of the investment." The moves would "overcome Telecom's reluctance to invest" and speed up the development of broadband infrastructure.[55]

COPPER CAN'T COPE

The second major report on the state of our ICT infrastructure was delivered by the New Zealand Institute in its 'Defining a Broadband Aspirations' which urged the country to shift focus from penetration to increasing the speed of the network.

The report claimed economic benefits to the country through pervasive higher speed broadband could range from $2.7 billion to $4.4 billion a year. "There is a significant cost to waiting. The longer New Zealand waits, the more economic value it will forego and so [it] should approach the investment in fibre with urgency."

Report author David Skilling said his methodology was based on a conservative estimate of global and local growth rates and likely benefits over a five-year period, and in many cases the economic benefits could be much higher. "File sizes shared over the Internet have increased significantly and New Zealand will soon hit the bandwidth wall. Residential bandwidth demand will continue to grow strongly and will soon exceed the capacity of New Zealand's network. Copper will soon be unable to provide for the demand expectations of high bandwidth homes in the UK. The same will be true in New Zealand."

The report claimed that by 2012 most homes would demand more downstream bandwidth than ADSL or ADSL2+ would be able to provide. Within a decade, it was likely speeds of 50–100Mbit/sec would be demanded in many parts of the market. "New Zealand needs to invest for the future, not simply for today's demand."

Quality communications infrastructure was an important driver for attracting foreign investment in an increasingly competitive global environment. There were numerous examples of proposed foreign investments or projects not proceeding because of perceived inadequacies in the quality of New Zealand's communications infrastructure. "New Zealand is more likely to receive greenfields foreign investment in the weightless economy than in, say, manufacturing." In order to attract this type of foreign investment, world-class communications infrastructure is likely to be a particularly important driver, said the report.

Accelerated adoption could deliver an additional $16 billion in production and growth benefits and strengthened innovation. Failing to invest might mean new opportunities going offshore, our relative

Fibre being layed for TelstraClear's South Island network build, November 2006.
Photo: TelstraClear.

position to other nations worsening and GDP losses rising as high as $1 billion–$2 billion, said Skilling. Fibre to the premises was the way to future-proof the infrastructure, with the resulting increase in speed opening the way for full potential of economic value to be captured. Back-haul and offshore links needed to be upgraded as part of this process to reach at least 75 percent of the population including all towns with populations greater than 20,000 by 2018. That, he said, meant fibre investment must commence with urgency.

"The aim should be to front-load the investments so as to rapidly capture economic value quickly. New Zealand must move quickly or much of the economic value will be foregone. A specific pathway must be mapped out with timelines for deployment to different market segments. Any debate should be on actions to be taken over the next few years rather than whether this aspiration is defined in exactly the right way." The roll-out of fibre should commence by mid-2008, said the report.

RACE FOR MEDIA MONEY

There was potential revenue growth of $600 million in the digital media sector if higher speed pipes were provided for film and other content-rich industries. The high cost and low availability of fast communications was impacting on the productivity of creative companies having to physically transfer files or hugely compress them because the current cost and availability of high-speed networks was prohibitive.

The New Zealand film sector was generating more than $2 billion in revenues and 60–70 percent of this was earned in exports. New Zealand's Asia-Pacific film sector had grown by 65 percent to almost $50 million since 2005 as production capacity shifted away from large United States productions towards the region. "Access speeds of competitor nations were growing rapidly and unless New Zealand could play as an equal it would miss out on potential growth. The benefits of faster broadband access at lower cost could lead to 15-20 percent improvement in productivity in the digital media sector, which regularly needed to move gigabyte files between locations," Skilling said in the report.

If we had fast enough connections around New Zealand we could do live collaboration, working on the same files, and that would really change the way we do these projects. I'm about to send a 60GB hard drive to Wellington because it's cheaper than sending it over the wires.
A large New Zealand media production house, quoted in The New Zealand Institute's 'Defining a Broadband Aspiration' report, September 2007.

The next stage of the Institute's project would focus on defining a specific pathway to fibre. "New Zealand should develop an efficient pathway to the rapid roll-out of fibre with an initial focus on investing in high-value segments from which benefits can be realised rapidly."

Within weeks of the two major reports condemning our low levels of investment in telecommunications, new Telecom boss Paul Reynolds agreed to accelerate the carrier's NGN plans.

Originally Telecom claimed there was a billion dollar shortfall in what it planned to spend and what was needed to achieve the government's Digital Strategy goal of 5Mbit/sec speed to 90 percent of New Zealanders by 2010. Reynolds said Telecom had undertaken a 're-planning process,' looked at its annual investment strategy and determined how much could be pointed towards the IPNetwork. "We're planning to create a world-class next generation network and broadband footprint for New Zealand – it's as simple as that," he said. A revised $1.4 billion plan to accelerate the next phase of the

NGN footprint would deliver speeds of 'up to' 20Mbit/sec to all towns with 500 or more phone lines over the next four years. This now formed part of a legally binding commitment to the government as part of the operational separation process.

David Cunliffe said the move signalled the incumbent was facing the future and investing. "That ups the ante on the rest of the sector to get in as well ... the real challenge now is for the public and the sector to get their heads around the fact that a sea change is occurring."[56] The additional investment in fibre across rural and urban New Zealand would support sophisticated offerings including faster broadband up to 20Mbit/sec, VoIP and new technologies and services that might require even faster speeds in the future.

"Operational separation has given Telecom the opportunity to re-plan its broadband strategy and accelerate the upgrade of the existing network in ways that will support New Zealanders' aspirations for the digital age. Specifically, we plan to install more fast ADSL2+ technology, more fibre to the street, and create a next generation network capable of supporting a wide range of world-class IP-based services for our wholesale and retail customers," said Reynolds.[57]

Telecom faced fines of tens of millions of dollars if it reneged on its commitment to deliver 10Mbit/sec speed to 80 percent of New Zealanders and 20Mbit/sec to 50 percent of the population by 2010. Telecom's network division would also be forced to give rival carriers the same deal on services it gives its own retail operation. It could face fines for breaching that commitment plus $500,000 a day for every day any breach continued. "Plus I've got all sorts of other swords of Damocles in my toolbox If I need them," Cunliffe told *NZ Herald* telecommunications writer Helen Twose.

Reynolds said Telecom would "run like greyhounds out of the gate and get the job done," within four years.[58]

SERIOUS OR A SIDESTEP?

Telecom's next generation IPNetwork had been underway since 2001. A forward-looking statement in July 2004 outlined a decade-long 'next phase' where a billion dollars would be invested in rolling out fibre and next level DSL to bring broadband to most New Zealanders. In 2006 Telecom had offered to increase investment in its back-haul network by spending hundreds of millions in rolling out fibre to almost all towns. That offer was withdrawn when the government decided on re-regulation.[59]

In the lead-up to the operational separation decision Telecom had been considering the investment required to deliver broadband speeds of 20Mbit/sec to 100 percent of customers. It was suggested its early 2007 investment plan could have delivered 20Mbit/sec to about 30 percent of customers by 2011. Various numbers were being tossed around about the cost of completing that task, most of them in the billions. "Numbers like $100 million are doable, $3 billion less so. If the government wants to target higher levels of penetration or performance there's a gap that needs filling," said Telecom CFO Marko Bogoievsky in March.[60]

Then in April Telecom chairman Wayne Boyd said Telecom was prepared to spend only one third of the $1.5 billion required to achieve 5Mbit/sec to 90 percent of New Zealanders by 2010 if operational separation went ahead.[61] In August Telecom, which had been chastised locally and internationally for many years over its failure to reinvest in its network, had forecast capital expenditure of around $950 million for the 2007–2008 year. So was there some creative accounting going on here?

If it was going to cost $1.5 billion to get 5Mbit/sec to 90 percent of Kiwi why did Reynolds think he could get at least 10Mbit/sec out there for less? And how much of the investment being promised

by Telecom over the next four years had already been foretold, withheld, and was now being put back into the play again?

Then you had to take into account Telecom's own statement that only 75 percent of customer lines were capable of speeds of more than 6Mbit/sec, and it was doubtful you could get more than 8Mbit/sec over 65 percent of them. While Telecom claimed 93 percent of New Zealanders could get broadband through their phone lines, the average speed for the 38 percent who had taken up the service by September 2007 ranged from 2Mbit/sec to 3Mbit/sec.[62] If that didn't present a clearer idea of how difficult the journey to 20Mbit/sec was going to be, another sobering fact was the dire shortage of contract labour which had already been cited as one of the reasons even existing broadband goals were unlikely to be met.

Reynolds had made the proviso that the pricing argument wasn't over and Telecom planned to engage energetically to get the deal it wanted. Final pricing for wholesale broadband services and LLU would be critical ingredients in escalating its DSL2+ and fibre to the street roll-out, he said. Clearly Telecom had cut some kind of deal during the Commerce Commission hearings over pricing of LLU access.

The Commission's decision, having considered 'other benchmarking factors,' increased the fees competitors would have to pay for using Telecom's unbundled network by 14–20 percent per line from the interim announcement in July. The new numbers had ISPs smarting and would inevitably mean lower margins and higher costs to consumers. So what was achieved by that? You had to wonder how serious the government was about ensuring pervasive high-speed connectivity across the country when its own anti-competitive unit was raising the barrier to entry.

The announcement that Telecom planned to roll out two million metres of fibre and deliver 3600 cabinets to take fibre closer to the nation's urban homes by 2010[63] resulted in what sounded like a collective jaw dropping across the competitor space. With a few exceptions those planning investment in LLU seemed horrified. However it was surprising they hadn't been a little sharper. While their focus was on the copper, Telecom had been planning ahead. Its next generation roadmap hadn't exactly been a big secret; it had even disclosed plans to accelerate that process when it met with wholesale customers in June.

The greater concern seemed to be that Telecom was cabinetising the same exchanges competitors were installing their local loop equipment in. In other words Telecom was vacating the premises to take its equipment closer to its customers just as its competitors were gearing up to share its network in the old centralised exchanges. Was this shades of Wellington and Christchurch, where Telecom had targeted competitive services in the exact spots where TelstraClear was delivering a full service? Those locations quickly became the most competitive in the country with the lowest prices across all services. What was about to happen in the local loop wasn't exactly what the government had in mind when it set out to improve broadband competition. Sure, competitors would most likely get access to the cabinets if there was room, but that was another strategy altogether and it could require another period of protracted debate to clear the way.

Ahead of the mandate for firming up operational separation Telecom appeared reluctant to advise competitors about the specifics of its roll-out and was attempting to skirt around the government's clearly stated guidelines for separation. InternetNZ was concerned there were serious deficiencies in Telecom's proposal.[64] Its executive director Keith Davidson described Telecom's draft undertakings as 'death by a thousand cuts,' which lacked detail and subtly diluted requirements for behavioural changes. He was particularly concerned about the lack of detail and disclosure around the roll-out of future NGN services, including fibre. He was also disturbed that Telecom appeared to be ignoring the ban on short-term performance incentives across separated Telecom divisions. In Telecom's draft undertaking up to 80 percent of the wholesale manager's incentive could reflect the

performance of Telecom as a group.

TUANZ said Telecom faced a juggling act in terms of its legal obligations to the government and its shareholders which were at cross-purposes with the intent of operational separation – which aimed, among other things, to improve the availability of services to Telecom's competitors.[65] There were concerns that sorting out such conflicts of interest could put the practical economic lifecycle of unbundled local loops at risk.[66] David Cunliffe warned Telecom to get its separation undertaking back on track or he would act to do so himself.

VIEW FROM THE SUMMIT

The overall outcome of November's Digital Strategy Summit echoed previous talk fests: the desire for New Zealand to lift its game in the global market and to use ICT to help it win the race was clearly articulated. There was a strong focus on the need for greater resource sharing between carriers, greater levels of competition and stronger industry-government collaboration.

Cunliffe challenged a new generation of innovators to take New Zealand's ideas, companies, sector and economy to the next level. "We need to be better than the global market in our chosen niches – the race is getting faster and we must play to win." Greater partnership was needed between government, the ICT sector, business, and the community. He said the government's long-term vision was for fibre to the home[67] and warned Telecom to go much further with its NGN plans. Unless the country got a lot closer to meeting the government's OECD objectives, more intervention would be necessary.

There was no question the serious players would persist. Unbundling the copper was too good an opportunity to walk away from even with slimmer margins and greater investment required to get into the essential cabinets. The bigger questions of equitable fibre access, the skills crisis, and how to leverage technology to boost our exports were also pressing. The government wanted to see 90 percent of households with 20Mbit/sec access speeds by 2012 rather than Telecom's proposed 80 percent at 10Mbit/sec.

The long-term goal was to have fibre to the home; despite competitors' cries of foul over cabinetisation plans, the local loop would still remain viable in many areas, but FTTN was 'simply necessary.' Cunliffe said New Zealand needed to think outside the square when it came to funding infrastructure builds and the government was open to subsidies for cable projects, including funding its own cable across the Tasman to improve Internet traffic price and capacity.

In 2007 only 54 percent of Telecom's rural customers could get broadband services and its average net investment in rural areas had been 'negligible.' Cunliffe hinted Broadband Challenge funding could serve rural areas and outer urban areas if communities could link fibre loops together.[68] National party IT spokesman Maurice Williamson proposed that all government entities make their land available for the laying of fibre; for example, laying empty pipes down the side of the road when building new roads so that any company could lay fibre there. He suggested there be a mandate that every new subdivision have not only water, sewerage, and electricity to each house but a fibre connection as well.

Rod Drury, chief executive of Xero, suggested the government do a debt-type investment in infrastructure, in order to get open access broadband out to as many people as possible. An investment of $2 billion–$3 billion seems like a small amount of money, considering the possible return on investment.[69] Broadband seer Simon Riley agreed that an injection of $3 billion–$4 billion – perhaps through posting infrastructure bonds – would make all the difference, even if it had to cut a deal to roll the assets of Kordia into a new company and get other big players; especially lines companies, to take a minority shareholding.

"It's not a big step, essentially the lines company would be open access anywhere." The government was already investing in broadband through KAREN, GSN and Kordia and was talking about health and education. In fact the government was the biggest customer for these services, but was still failing to fully co-ordinate its investment. Perhaps it was now time to consolidate its resource to benefit everyone, said Riley.

While some progress was being made on the three wealth, creation areas isolated by the government – biotechnology, ICT, and the creative industries – not enough was happening.

We needed to have a long, hard think about what we needed to do as a nation to deliver software as a service and the investment required, not just in the three-year political cycle leading up to an election but with long-term goals in mind. "If we are going to talk about a 'weightless economy' as our future, as opposed to shipping things around and all the carbon miles that entails, we have to be able to deliver something to the world, and it's all about applications," said Riley.

Certainly it was hoped that Telecom's apparently magnanimous offer to expedite its NGN would not give the government any reason to duck out from under industry pressure to lift its own game, create clear incentives for further private sector investment and lead the way with its own billion-dollar broadband booster.

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20/20 visionaries

Beyond the seven Cs

> This is the real McCoy – 50–60 years from now whole history chips will be devoted to this time discussing how countries of the world either successfully or unsuccessfully exploited this moment.
> David Pearce Snyder, *The Futurist* lifestyles editor, Ninth International Conference on Thinking, Auckland, January 2001.

The world is in the midst of a genuine technological revolution of historic proportions as fields of endeavour converge to deliver a transformational impact to rival any previous social or industrial shift.

In New Zealand the metaphorical and literal tenders are out to complete the circuits of connectivity that will allow the true spark of creativity to flow across the nation and out to the world.

If New Zealand is to leapfrog back up the OECD pecking order it won't be one idea or the action of any single group that creates the groundswell but an energising vision that can inspire and involve all New Zealanders, not just the technically literate. Connectivity has to become a lifestyle decision. The New Zealand promise, much like the Bush administration's directive of 2004, that every household would have true broadband by 2010, could become a huge catalyst for change if only the bureaucratic foot is removed from the brake pedals of innovation and creativity.

With the right incentives, people could live and work where they want without having to worry about bandwidth bottlenecks. Migration from the major cities to middle New Zealand could deliver on the ancient promise of returning vitality and prosperity to communities previously written off as ghost towns.

Built on our formidable reputation for movie, documentary, and software creation we could become a haven for artists, writers and musicians, scientists, researchers and information workers. If our inventions and breakthroughs were valued, protected, and patented, our best ideas in every sector from agriculture to engineering, electronics, medicine, biotechnology and education could be exported, with the financial benefits remaining here rather than going offshore.

We could encourage the building of secure repositories to back up our own data and that of major international players, confident their secrets were safe from itchy nuclear-trigger fingers and terrorists plots. With expanded undersea-fibre capacity imminent, this would not only bolster our

own brightest industries but attract offshore investment, perhaps with the proviso that the bulk of profits are reinvested here. All of this could turn our brain drain to a brain gain, encouraging skilled expats to return with their associates, eager to experience our connected lifestyle. Perhaps special incentives ought to be offered to those who bring their jobs back with them.

The early Digital Strategy vision identified connectivity, content, and comfort as the three Cs needing to be addressed to fully engage in the new global digital economy. Others suggested a further four: competition, which drives prices down and options up; collaboration, with the public and private sectors and community working more closely together; creativity, and finally; compassion, which puts people and relationships firmly back into what has so far been a revolution with a cold heart.

The government identified three industry sectors it hoped would deliver high levels of export growth: biotechnology, the creative industries, and ICT. The Digital Strategy has become an umbrella catch cry embracing what many in the ICT industry have been trying to champion for over three decades. We are definitely at the crossroads and there is no shortage of evidence pointing the way forward, so why are we still staring at the signposts?

Throughout this book the common threads include a call to significantly increase investment in faster, more widespread broadband, and an improved roadmap geared for tomorrow not dotted with outdated destinations. Will the government, having shaken up the telecommunications sector, unbundled the local loop, and split Telecom into three divisions, move back to the sideline, or take the game to the next level?

PREPARING TO ADVANCE

An important message has gone out rallying the troops to take new ground: "Send reinforcements we're going to advance." Passed on in a series of Chinese whispers it is feared a premature message might have got through, "Send 2/6d we're going to a dance." It is not yet time to put on the party hats. There is much work to do and it is important to know the right messages are getting through.

Is the government truly behind the 'can do' Kiwi attitude envied the world over and committed to removing all obstacles so our best could be put to the test, or are we being humoured by consultants and bureaucrats with their interminable art of frustrating the go-getters with administrivia? There is a serious need to rebuild trust all around, certainly to believe we have matured beyond empty election-year promises, dirty tricks, and PR persuasions where 'confusion (is a) chief marketing tool.'[1]

By late 2007 another round of high-level industry reports clearly stated that unless the government took a strong leadership role backed up with a multibillion-dollar investment to transition from worn-out copper to future-proofed fibre to the home, our chances of gaining traction in any of the OECD report cards will rapidly slip away.

Within days of plugging into the first few unbundled Telecom exchanges, Orcon and Vodafone had given some idea of what lay ahead by shaving $40 off residential phone bills. TelstraClear and Orcon were moving into the mobile phone space reselling Telecom and Vodafone services, and huge investments in wireless networking were being announced. The challenge was for Telecom's competitors to move quickly to achieve the scale necessary to not only survive but thrive.

More acquisitions were in the wind, more partnerships between new carriers to share equipment at Telecom's exchanges and relationships with urban fibre providers to get the broadest coverage possible. Broadband alone was not going to be enough, this opportunity was about long-term gains not only getting customers but keeping them, and delivering the sexy stuff: videoconferencing, IPTV, video-on-demand, VoIP, and a range of new added-value services.

Chris Lewis, senior vice president of Ovum Telecom Research, in his August industry report explained reinvestment was now more important than ever for the major carriers to avoid losing huge traction as other players encroached on their territories. "New generation networks, like the one Telecom is currently planning to bring into full service by 2010, are a pivotal part of this rationalisation; enabling a unified service platform for business and consumers alike that can deliver anything it or its competitors, who will remain its biggest customers, need to deliver."

Lewis said traditional voice and even broadband and mobile services were reaching saturation point in developed nations and their profitability was declining. The conduit had been developed and exploited for basic services, now the focus was shifting to more specialised and advanced services including new media and content which would attract more customers but at lower margins. "In the current and future environment, where services are defined by the customer and other industries, the telco faces a squeeze: invest in the short term, while revenues are often falling, in order to be in the right position five or ten years down the line"

Telcos needed to change their commercial and organisational structures to compete in this broader world. "Given the level of investment needed to bring the network up to speed, and given the equally high costs of acquiring the skills and products to sell in the new media age, shouldn't telcos face reality and try to become the most efficient wholesale providers on their particular planet and accept that margins on wholesale may well be greater than those in new media and IT products and services?"[2]

How many more voices needed to be heard? After nearly two decades of letting the market decide it was clear that public-good outcomes would always be sacrificed for shareholder returns. InternetNZ and TUANZ had been stating for several years that the only way forward was fibre. Telecom's former CEO Theresa Gattung had, only weeks before her exit, recommended that if the government wanted faster and wider deployment of broadband anytime soon it would need to invest hundreds of millions of dollars in partnership with phone companies and industry.[3]

A steady stream of reports from the OECD and others continued to slam our slackness in getting broadband penetration up to speed, and while we'd held 21st placing in the OECD for two years after years of languishing at 22nd since 2000, we'd had plenty of time to consider the way forward. The 'Connecting to Our Digital Future' report[4] agreed a 'substantial lift in investment' was needed.

Within seven years, technology, research, film, medical, and financial services industries would require public data speeds of 100Mbit/sec with gigabit speeds following closely behind. By 2016 we needed to have fibre very close to the home, if not into the home. The estimated $10 billion required to provide fibre to 97 percent of New Zealand properties was a small price to pay when considering the growth it would bring to GDP.[5]

The New Zealand Institute also urged the government to take a lead in the roll-out of higher-speed broadband to meet the demands of the future or forgo significant economic returns. If it moved ahead 'with urgency' this could lead to returns of $2.7 billion to $4.4 billion a year in an invigorated economy. Report author David Skilling warned we were about to hit the bandwidth wall with copper unable to cope with the demand and also advocated speeds of 50–100Mbit/sec for many parts of the market.[6]

The dire state of our existing infrastructure and the huge investment needed to get up to speed had been clearly identified. Former Telecom chief technology officer Dr Murray Milner, had warned a year earlier that unbundling was too reliant on copper cables and it was likely to cost $1.5 billion to reduce copper loop lengths from 2km to 800 metres so 90 percent of New Zealanders could get 5Mbit/sec broadband access.[7] It was almost as if his old employer had taken his advice with its late-to-the-table promise to inject $1.4 billion to deliver 10Mbit/sec to 80 percent of New Zealand homes and up to 20Mbit/sec to 50 percent of homes by 2011.

There was more activity in moving the infrastructure and competitive environment forward in 2007 than there had been in years but was the dominant player really turning over a new leaf or doing now what it always knew it must do to survive?

What was needed was a much clearer roadmap with identifiable times, destinations, and outcomes and clear rules for investment and competition. New Zealanders needed to know what they would be missing out on if this goal wasn't achieved. Regardless of Telecom's belated peace offering, the groundswell to go the whole distance was rising, the market was opening up, the pressure was on for the state to drive connected New Zealand forward, and the latest series of reports suggested this was our last chance to dance.

COMPELLING REASONS

So what were people doing on-line? According to ComScore in March 2007, 1.9 million New Zealanders aged 15 and over viewed 3.6 billion pages of Internet content, went on-line every other day and spent a total of 20.4 hours connected each month. The top three destinations were Microsoft sites (1.42 million), Google sites (1.39 million), and Yahoo! sites (1.1 million). New Zealand–based TradeMe and government sites rounded out the top five most-visited locations, garnering 977,000 and 621,000 visitors respectively. Other sites in the most visited category included Bebo, Wikipedia, Auto Trader, eBay, and Cnet networks.[8]

In the year to July 2007, Nielsen//NetRatings and its associated companies suggested 84.5 percent of New Zealanders had Internet access, 69.9 percent from home and 46.9 percent with broadband access of some kind. The main drawcards were local news and information, accessing search engines, entertainment, overseas news and information, travel, auction sites, sports, jobs, properties, telecommunications, finance, government, computers and electronics, family and education.

The research company said 75 percent of surfers engaged in Internet banking, 68 percent read an electronic publication, 55 percent had received or paid a bill on-line, 50 percent had downloaded software and 52 percent had watched a video, up from 38 percent on 2006. Auction sites were another big activity (34 percent) and there was a slight increase in the number of people who investigated a purchase and then acted on it. Those using credit cards on-line showed a massive increase from 28 percent to 43 percent.

Nielsen//NetRatings' overview of the most popular sites in October, based on page impressions and unique browsers, saw TradeMe with more than double the overall hits (2.69 million unique browser impressions) of nearest site Microsoft Network (1.02 million), then in descending order *NZ Herald*, Stuff.co.nz, Air New Zealand, ASB and Westpac Banks, the White Pages and Yellow Pages, the National Bank, TVNZ, TV3, BNZ, Vodafone, Telecom, Xtra, the MetService, Seek, Wises, and ANZ Bank.

Revolutions usually begin with hype and hoopla and promises of a new golden age with little or no forethought as to how to get to the envisaged destination or how to handle the fallout during the transition. While broadband is readily available it is still considered a relative luxury, and as a consequence the benefits haven't filtered through to some sectors.

InternetNZ executive director Keith Davidson believed the Internet hadn't really changed lives yet as many were still only using it for a bit of email and browsing. "We're a bit scared of broadband because it's expensive, not particularly robust and not particularly fast. We're not working a day a week at home and reducing our carbon footprint because we don't have sufficient confidence in this infrastructure to deliver. In the rest of the world the Internet is changing the way people do business and the way they work."

Because some people used Internet banking and bought and sold a few items on TradeMe they felt they were endorsing the Internet but there was a lot of social change ahead. "A lot of changes

are needed at the infrastructural layer through building community networks and that's where the government needs to be the catalyst, getting people talking and providing alternate methods for deploying networks, other than just Telecom."

Davidson said environmental issues would become an increasingly important issue. "There needs to be a change for our little country; our traditional exports of sheep meat, wool and dairy produce represent a big carbon footprint. The threat to our goods will only increase and we can't do much else apart from exporting knowledge. If we're going to be knowledge leaders we need the right infrastructure, the right educational processes, and to be training our techies and rewarding them rather than letting anyone who's got half a clue disappear off overseas."

In many ways this echoed 20 years of visionary but practical messages from the ICT sector. "It's the same old, same old and while the government's strategies are attempting to address these things by saying where it wants us to be in X number of years I haven't seen a clear roadmap yet of how to get there," concluded Davidson.

All the data we were being fed about life in New Zealand suggested we were indeed living in Godzone, a virtual paradise at the bottom of the world; one of the least corrupt and open nations,[9] where it was easy to do business. Job confidence was at an all time high, unemployment at an all time low – and everyone had high levels of life satisfaction. We were a worker's paradise, with the highest level of job confidence in three years, and continued faith in the employment market's strength, according to the Westpac McDermott Miller Employment Confidence index.

Official unemployment was just 3.6 percent and had been under 4 percent since 2004. This was one of the lowest jobless rates in the industrialised world – lower than Switzerland and almost as low as Denmark. Westpac economist Donna Purdue said employees "emphatically believe current strong labour market conditions are here to stay ... There has been a booming demand for labour and supply can't keep up."[10]

An APEC international study found New Zealand had one of the 'most open and flexible economies in the OECD' in terms of meeting the goals of free trade within developed countries by 2010. It said wide-ranging reforms since the 1980s had made the regulatory environment one of the best in the world. The report noted the economy had continued to be opened up since the previous study in 2003, with more tariff and non-tariff barriers to trade being removed. It also praised New Zealand's openness in recruiting foreign workers to fill skills shortages. The negatives were New Zealand's large external deficit,[11] 'very low' household savings and persisting strong inflationary pressures. APEC also pointed out the continuing dependence on commodity-based exports despite government efforts to diversify.[12]

According to a study by the Legatum Institute for Global Development, New Zealand topped the world in terms of 'life satisfaction.' The Prosperity Index survey is "a measure of what makes life worthwhile," said managing director Alan McCormick. The Legatum Institute ranked 50 countries according to two broad categories, 'material wealth' and 'life satisfaction.' These were rated on 20 diverse indicators including capital accumulation, climate and divorce rates. New Zealand got top ranking in life satisfaction due to strong civil liberties, health of the people, strong communities, and the fact we apparently had lots of leisure time. In material wealth, New Zealand ranked 11th, just behind Denmark.

In the 'commercialises new ideas by exploiting innovation' category, however, New Zealand earned a score of negative 2, compared to Ireland which scored 23, and had launched itself to the forefront of the technology sector. The countries with the highest material wealth tended to invest in technology and equipment, didn't depend on foreign aid, their people were well educated and innovative, and they had responsible governments but not too much expensive bureaucracy. In the countries with the highest levels of life satisfaction, people felt they had control over their own lives.

They had good health, lots of opportunities and good pay cheques. The Prosperity Index showed New Zealand outranked Australia in competition, education and leisure time, but Australia had higher incomes.[13]

While the World Bank in its 2007 survey rated New Zealand at number two for ease of doing business, National's Small Business spokesman, Lindsay Tisch pointed out the survey also ranked the country 16th in terms of ease of exporting and gave a low rating for its high business-compliance costs.

"We are a country that lives and dies on its exports but still, under this government, a major survey ranks us a dismal 16th – and this is supposed to be Export Year ... What's more, the survey ranks us only 13th in terms of the compliance cost of employing workers. That's not particularly good when employment-related compliance is an issue that is consistently raised by the Small Business Advisory Group, and is a major issue in growing businesses from sole charge to a stage where they are employing workers." The Business NZ-KPMG Compliance Cost Survey showed the government was failing to address the burden of compliance costs, with small businesses having a compliance burden three times that of big business, said Tisch.[14]

Comfort and confidence were essential components in the new vision; people needed to know their skills and aspirations were valued. We needed to know we had the right people in our talent pool; that we were educating and training people for the future they were going to have to live in, not one that continued to borrow from the colonial past. We faced impending disaster on both counts, with severe skill shortages across ICT and engineering and fewer people training to fill those gaps.

Another warning sign was the broadening chasm between the haves and have-nots. We had a growing, technologically aware and well-paid elite, a burgeoning middle class earning less than $35,000 a year (30 percent less than Australians),[15] and a swelling underclass, which had difficulty paying for necessities let alone investing in a PC, Internet connection, Freeview box, or Sky subscription.

The nature of work was certainly being redefined. It was no longer a tactile thing for many of us, as we peered into screens and clicked and dragged text, symbols, and images 'out there.' The use of technology clearly contributes to the nation's wealth and export earnings. If we end up working longer hours for lower wages than comparative economies and are denied a share in the benefits – for example the kind of tax relief fuelling the Australian economy – a sense of disappointment sets in, sapping the vitality a nation needs to rally around any kind of national vision.

If we are intimidated by the machinery, with little incentive to upskill or improve our work and social contributions, something vital bleeds away. With pressure to perform and bills to pay, weekends disappear, weakening family and community ties. In New Zealand a growing sector of society felt sidelined by the digital divide. Suicide rates, through economic and social pressure, matched those of the 1930s depression era. Without hope beyond Lotto-ticket fantasies, our national mental health would continue to decline. Without some inspirational sense of who we were as a nation, during this time of massive change, our identity crisis would only deepen.

CULTURALLY COLONISED

As former Irish cultural minister Michael D. Higgins so eloquently put it during his visit to New Zealand in 2000, cultural diversity makes the community creative, while information technology simply provides a set of techniques with people learning to function but not understand. "The creative society enables the knowledge economy to emerge. The knowledge economy as a substitute for the creative society is a disaster. It's a recipe for obsolescence and unhappiness."

If you looked around it wasn't too much of a stretch to see that New Zealand was being colonised again. This time the price was not muskets and blankets but access to our homes through the new digital conduits of commerce, broadcast, recorded, and on-line media. Our media were delivering endless movies, songs, and images and high-rotate imported content from elsewhere. So what content was going to travel down those bigger, fatter pipes once we had this coveted communications capacity? The bulk of Internet traffic was coming from offshore, and was unlikely to change significantly in the short term. So what did this mean for our own content and creativity?

If we don't get to see our own culture, our past, present, and possible futures beamed back at us, we risk losing our sense of place. We become displaced in our own environment, pulling in every B-grade reality TV programme to fill the gaps rather than fostering our own actors, programmers, artists, musicians, composers, writers, animators, software developers, editors, directors, and film and documentary makers. Local content is severely lacking and the statistics are often blurred through the number of repeats and back catalogue re-releases. So what are the new state-owned channels for?

Will digital TV open up the promise of fostering new local content and encourage community channels like Triangle, or will they find themselves priced out of the market? My own biased view is that Radio New Zealand National does a great job of reflecting the less frenetic elements of our culture back at us. Kiwi FM fought for years to launch, and there are many great Maori and community stations where people actually talk and share. But so often what passes for entertainment is juvenile fourth-form humour. Digital in all its forms must open the door to broaden the broadcast formula so we can enjoy all the flavours that are New Zealand and discover our true culture before we forget what the word means.

InternetNZ president Pete Macaulay believes it is important the wider issues of content are carefully thought through in this new environment. "Our legacy documents, the historic information, some of the wonderful recordings, they are all an important part of our story. I very much regret that I never recorded some of the histories my mother's generation had inside their heads. We're a non-oral-communicating society and we don't repeat the stories over and over so they get transmitted accurately down the ages. They did this, they repeated … I remember my mother and her sister repeating stories over and over and they'd get emotionally involved in the story again."

He said our stories are an important part of our humanness and need to be passed on. "That's why story telling is so important and why when you sit a bunch of kids down for a story telling they're entranced. There's no video, no Disney, no commercial breaks, they're just sitting listening to a story and they're absolutely wrapped up in it." At the core of the content component, he said New Zealanders need to get back to story telling; New Zealand stories in particular. We have, as a nation been culturally colonised by the Americans. We need to get back and ask the question, "What am I doing?"

Since the 1970s New Zealand's productivity growth has been consistently lower than in other developed countries. Low productivity brings lower wages – the main reason why 20,000 New Zealanders a year leave to live in Australia. Higher productivity must be New Zealand's priority for a better economy,[16] Business New Zealand, Workplace Productivity Working Group report, 2006.

WORK-LIFE IMBALANCE

GHOSTS IN THE MACHINE

The great promise that advances in technology and communications would release us from the menial workaday world, so we could enjoy more of our

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country and culture with family and friends, has proven a seductive lie.

While we are quick to laud the transformational power of ICT we have paid little heed to long-term social consequences. While the march of the new machines was reinventing government and industry, empowering small business and bringing endless gadgets and tools to consumers, there had been little relief for the worker. The four-day week was exposed as a myth.

Many firms had built successful cultures where teams that worked together, played together, and were rewarded on performance. Generally though, the workplace was demanding more for less. Sales targets were set higher each year, mobile technology meant people were eating into their own time to achieve goals, and stress levels were rising steadily. The new sweatshops were the call centres and data processing houses where menial tasks were outsourced and rows of operators sat like battery hens, answering phones or pecking away at keyboards.

The workload had doubled since typewriter days but even the first 'information age' ailments were sidelined. RSI became the more politically correct occupational overuse syndrome (OOS) and was virtually dismissed when stressed keyboardists complained or sought compensation from the Accident Compensation Commission (ACC). Meanwhile government and business were using invasive technology to track, and control. Increasingly data was collated on individuals, email was monitored, keystrokes counted, fingerprints verified, and workers watched on closed circuit TV.

Labour MP and former union leader Darien Fenton reckoned one-fifth of all New Zealand employees now worked more than 50 hours a week, enough to make Samuel Parnell, who lobbied for the eight-hour day from 1840, roll over in his grave. Fenton claimed more than 20 percent of employees worked more than 50 hours a week, a level exceeded only by Japan and South Korea in the developed world. She said 40 percent of male workers aged 35–54 – the vast majority of family men – were the main culprits, and women weren't far behind with 17 percent now working 50 hours or more a week. "For me Labour Day has become a day of mourning for the ground that has been lost. We have got among the longest working hours in the OECD."[17]

In 2006, we had one of the highest proportions of employees putting in long hours of paid work, and the second-highest rate of average hours worked per year. With our low unemployment, and widespread skill shortages, the trend looked set to continue according to Paul Callister, a senior research fellow at Victoria University of Wellington's Institute of Policy Studies and author of several papers on overwork.

OVERWORK ETHIC

While many New Zealanders worked long hours because they had no other choice, many did so voluntarily. "Many people simply enjoy their work more nowadays, and with new technologies it's easier to work on the move, at home or while caring for children. People who get paid well might work longer hours to sustain their lifestyle. Some want to pay off debts quickly, like a student loan or mortgage."

In the United States, the official 'overwork' cut-off is 48 hours, and while people work long hours they outsource a lot of the home responsibilities because the cost of labour is low. In

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New Zealand, where 'overwork' means 50 hours or more per week, people were going down an individualised route, juggling paid work and their other responsibilities, said Çallister.

Longer work hours may result in greater job satisfaction and a higher income, but they can also bring health and safety risks. "For parents, more time at work means less time for family, which raises concerns about child outcomes … If one parent reduces their hours, the other often has to work longer to make up the reduction in income. Longer work hours can also mean less time for oneself, risking the development of 'social capital.'"

From the government's point of view, having people work longer hours wasn't good for the health and safety of the workforce, or helping increase GDP in a sustainable way. The key to sustainable growth, it believed, was raising productivity, not work hours. "Increasing productivity is the only way that you can work shorter hours and still maintain your standard of living … People here have to learn to work smarter, not harder and use technology to their advantage. And there needs to be investment in things like research and development, new technology and training. But increasing productivity is hard for a country this size. It's going to be a real challenge for the government and employers," said Callister.[18]

While many parents may be happy to work longer hours, they sent a clear signal to employers in a 2005 survey by the Equal Employment Opportunities Trust when 93 percent said they wanted more choice in the hours they worked. That was reaffirmed in a July 2006 Department of Labour report[19] calling on employers to offer staff greater flexibility, but emphasised workers were often their own worst enemies when it came to work-life balance. It found 37 percent of workers regularly put in extra hours in their own time to get work done. The survey showed 19 percent of workers worked more than 50 hours a week; 37 percent said they often worked extra hours without pay; 60 percent said aspects of workplace culture made a work-life balance harder to achieve.[20]

DULL BOY SYNDROME

The work culture was apparently even more pronounced at management level. According to an international workplace survey, Kiwis worked harder than the Irish, but not as hard as the Australians. The survey, conducted by recruitment agency Robert Half, questioned 5,098 managers in 17 countries about their working hours and found 17 percent of New Zealand managers worked three weekends or more a month. Across the Tasman 21 percent of managers said they worked three weekends or more a month. The Irish were more laid back, with only 5 percent willing to give up their weekends.

It seemed Australians and New Zealanders just couldn't switch off. Only 26 percent and 20 percent respectively ignored phone calls and emails at the weekend. The Irish maintained much firmer boundaries between work and home – 55 percent of managers switched off entirely. Their working weeks were also shorter; only 3 percent said they worked more than 55 hours a week. Compare that with 13 percent of Kiwi managers working those hours and 11 percent of Australians. The main reason was they had taken on more responsibility and that company growth had led to a higher workload.

Twice as many Kiwis as Australians

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cited money as the reason for working longer hours. None of the Irish did. Robert Half's Auckland finance and accounting director Megan Alexander said the attitude of New Zealand managers reflected the changed business environment. The economy was growing and facing skills shortages and people were working harder just to get the job done.[21]

For all the hours we were putting in there was evidence to suggest we weren't actually gaining much ground. In his March 2007 report, Aaron Drew from the Reserve Bank of New Zealand appeared stumped when trying to understand why our productivity, performance, and prospects remained so low.

New Zealand's medium-to-longer-run growth prospects and general standard of living critically depend upon its labour productivity performance. Relative to most OECD countries, the level of labour productivity in New Zealand is low and, when measured as GDP per worker, the historic growth performance has also been relatively poor. [This] is a key concern for policy makers and has attracted much research attention. The focus has been to understand why performance has not been better, given that cross-country indicators of New Zealand's economic environment broadly suggest New Zealand should be amongst the highest performers, not a laggard.

Examining New Zealand's labour productivity performance has been a rich area of investigation by both domestic and international researchers. All measures of productivity suggest there is a large gap between the level of labour productivity in New Zealand and that of upper-income OECD countries. It has been a challenge to explain why New Zealand's productivity growth rate has been so low, given open capital market, and the widespread agreement that macro and structural policy settings should be conducive to, if anything, above-average productivity performances, thereby reducing the productivity levels gap. Notably, New Zealand's closest neighbour, Australia, has seen a marked improvement and internationally superior productivity performance over the last decade or so, following a roughly similar set of reforms and a roughly similar period of labour market deepening.

Labour productivity growth is usually seen as the key determinant of raising living standards. And, over the short-to-medium run, lifting New Zealand's labour productivity performance would seem to offer the best means for relieving inflation pressure in the economy, at least from a 'supply-side' perspective. In contrast, the scope for boosting supply capacities through further increases in employment rates would appear more limited, with participation rates at record levels (and near the highest in the OECD) and unemployment rates also at comparatively low levels. Nevertheless, New Zealand's present GDP per-capita level still lags OECD average levels by around 15 percent, Australian levels by around 20 percent, and US levels by around 40 percent.[22]

WHAT FOUR-DAY WEEK?

Internet pioneer John Hine often wonders what happened to the great promise that technology would bring us a shorter working week.

"If I look back 30 years I do have to ask why people were working 37–40 comfortable hours a week and now with all this marvellous technology most

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are working 45 hours. Papers written in the early 70s and 80s predicted technology would enable you to work 30 hours or less. Perhaps we haven't achieved that because there's no grand plan; maybe we don't have the balance of people with the right type of education and skills, or businesses that can accommodate the change needed, or the right kind of people who can take 90 percent of their income to work 80 percent of the time?"

He said New Zealanders seemed to respond best to pressure groups; perhaps that was the way forward. "We now have maternity leave, paternity leave and allow these people to have some more time off around childhood but we haven't taken the big step of saying we can reorganise our businesses and commerce to accommodate working less hours. Despite the market forces in the 90s and the knowledge economy and all that, we don't seem to have increased our productivity at all. How you actually change that involves a major shift. It wouldn't be an easy change to accommodate."

Getting back our work-life balance and becoming more productive by working smarter was a major challenge. Already we were giving up important moral ground in the name of progress. Similarly the 40-hour working week won by the first Labour Government under Michael (Mickey) Joseph Savage, which began to take effect between 1936–1946, was a hallmark in social policy, ensuring reasonable wages for reasonable hours.

Something was fundamentally wrong when we were working longer hours, often for relatively less money than comparative nations and achieving lower productivity. The old frameworks needed to be challenged. Kiwis had mostly taken the work ethic fairly seriously; we learned it from our pioneering forebears who worked to tame the land and defend the empire.

We should have held the ground they fought for and be standing on their broad shoulders to gain a clearer view of what's coming over the horizon, not so busy trying to make ends meet that the future finds us unprepared. It's time to get a life and, if at all possible, a lifestyle. We owe it to ourselves.

KNOW WHAT I MEAN?

The way we communicate is undergoing massive change, not only through the obvious upgrades and capabilities of the plumbing that enable devices to interconnect, but in how and what we communicate. Some feared the English language itself was under threat as txt shortcuts entered common use; even in exam papers and student essays some teachers and examiners considered this acceptable practice. So how were we going to maintain any degree of accurate communication in a world already littered with three letter acronyms (TLAs) and cute shortcuts?

Lawyers in particular had been singled out in the past for their appalling grammar, and yet what they wrote into contracts and agreements could have huge implications if what was said wasn't actually what was meant. Even worse doctors, pharmacists, and others dealing with medication or offering critical advice needed to consider the full implications of badly worded electronic exchanges. Was a hospital specialist to take offence when he got a referral message saying SOB, or would he quickly realise this was the technical term for 'short of breath'?

Increasingly there were legal requirements to save and store copies of emails and documentation, which in itself suggested long-term liability if things weren't right first time. As for

computer programmers, if they didn't get spelling right in their coding and technical documentation, another set of problems arose. There was so much room for misunderstanding and assumption as we fired short messages, quick emails, and ill-advised anecdotes around the workplace and to clients and friends.

The way we learn is also changing rapidly, with on-line tools at our fingertips we can now find out anything we care to know. Doctors, lawyers, scientists, ministers of religion and other professions, once believed to be holders of the keys to knowledge and able to charge accordingly or hold sway with their influence, can no longer trade on this exclusivity. I can Google a medical term, call up the latest knowledge about microbes, molecules or the moon, challenge theological theory, consult all the scriptures, or check out my legal rights and possible courses of action on the Internet.

Having access to information is only ever part of the equation, understanding, interpreting, and learning from what is uncovered requires different skills. Transforming raw data into knowledge and paths to wisdom requires discernment and discipline. It's important to look beyond the page and ask, what's really going on here? The Web is full of side roads, distractions, and disinformation. Knowing what sources to trust is imperative. Churning out endless copied notes from various sources, certainly without crediting the source and at least thinking through the content to form your own conclusions, will have you labelled either plonker or plagiarist.

THE TRUTH FAIRY

According to the *Wall Street Journal*, blogging came of age in July 2007. It was ten years old and ranked third only to the invention of the printing press and the Internet for its impact on the communications world. With the arrival of the printing press, information was able to flow down to the masses but the blog, in combination with the many other forms of digital communication, had broken down crucial barriers in the way information flowed.

Maxim Institute on its web site had this to say about blogging:

The most valuable commodity today is information – the rise of "spin doctors" bears eloquent testimony to the power of the information-mongers. In the past this source of power has been able to be controlled and evaluated by traditional "gate-keeping" institutions like governments, industry and the commercial media. Gradually though, the world of the blog is dispersing this centre of power, a trend which is scaring some and thrilling others.

Traditional sources of information are trusted because they have earned it. They are responsible for the quality and validity of the information they pass on. A government needs to pass on information to govern effectively. A newspaper needs to be accurate to keep their reputation; a loss of reputation will result in a loss of readers and consequently revenue. A lying blogger just starts a new account.

However, the electronic media can help keep the traditional media honest. The ability of an individual sitting at home with their computer to transmit information to millions of people with nothing more than a few clicks and keystrokes provides an excellent, if irascible watch-dog. A cover-up is now a very difficult task.

While this extra layer of security may relieve some, combined with the post-modern trend to view all opinions as equally valid, blogging also has a more concerning side. If it is to genuinely provide us with more information, then blogging relies on our ability to filter information and discern truth. But in an age so sceptical of experts and authority, can we really put blogging to good use?[23]

And it wasn't only ill-informed spin doctors and bloggers adding their opinion to the great Internet noticeboard you had to watch for. There are so many initially convincing urban legends doing the rounds that make you feel like you were a useless worm unless you add your signature to this or that call for social justice and pass it on to ten friends; or something so fantastic you just have to 'cc' it to your mailing list only to have your more knowledgeable peers question your discernment.

One colourful story teller caught me out many years ago with the one about the elephant who sat on the red mini thinking it was his circus stool. I believed the wonderfully affirmative toilet-door anthem 'Desiderata' had been discovered in an old church in 1692 but after posting it on my web site was informed it was actually written by Max Ehrmann in 1927, as Les Crane, who made a hit song of it in 1971, learned when he was sued for breaching copyright. I was actually going to use the statement in this book that the ideogram for 'crisis' in Chinese also means danger and opportunity, but on Googling I discovered it was another myth that had gained popularity after being misinterpreted by certain business gurus.[24] Sucker no more, I now try to check the *Skeptics Dictionary* and urban legends pages to ensure fantastical-sounding bar-room tales, New Age ranting and dinner – party wisdom have some credibility before I join the chain-letter chatter.[25]

If it sounds too weird to believe it probably is. And one source is not enough to establish a matter. Verify, validate, and confirm. Don't become an inveterate spreader of spam. Here's an eyebrow raiser that soon moved down to the chuckle bone:

GOOGLE ACQUIRES INTERNET

MAY 12, 2017 - BUSINESSWIRE. Mountain View-based search giant Google Inc today announced they've acquired the Internet for the astounding sum of $2,455.5 billion in cash. The deal had been rumored in various search blogs since the beginning of the year and was now confirmed by the company's CEO.

"This is in line with our vision to make information more accessible to end users," says Eric Schmidt. "With the acquisition, we can increase the speed of indexing as everything will already be on our servers by the time it's published." In a conference call earlier today, Larry Page explained the strategy behind the acquisition. "We realized it's not very cost-effective to buy the Internet in smaller portions." During the past two decades, Google had acquired YouTube for $1.65, DoubleClick for $3.1 billion, AOL for $12.5 billion, and last year, Microsoft for the record sum of $120 billion.

Questioned on the first steps the company would take integrating the Internet onto their servers, Eric Schmidt announced immediate plans to redirect Yahoo.com to Google's own search engine. "From an end user perspective, having two search engines is just bad usability, and [causes confusion]. While we appreciate Yahoo's recent advances in search technology, we felt this move is best aligned with the interests of our advertisers, users and shareholders." Eric added, "By leveraging third-generation mobile platforms in sustainable verticals, new monetization opportunities can manifest into an improved Web experience, greatly benefiting investors and digerati alike – a true paradigm change synergizing the Web 6.0 framework on the enterprise level."

Accompanying Google's acquisition revelation, privacy groups today released a paper criticizing the move. However, Larry Page argues that privacy is improved by Google's acquisition, explaining that "[the] main privacy issues for users today are data leaks to third parties. By eliminating all third parties, we closed this hole." Eric Schmidt adds that Google intends to replace their current privacy policy with a "privacy scale" which better balances necessary compromises. "When you can improve the privacy of a large

group of people by violating the privacy rights of a small number of people, in the end this improves overall privacy."

The Chinese government in the meantime congratulated Google Inc on their move. Regarding the potentials of expanded censorship, Sergey Brin told members of the press that Google would now drop all search results filtering and instead "address the root problem from a publisher perspective" by directly blocking certain keywords the time they are entered in Google-owned tools such as Blogger, Gmail, Page Creator, Yahoo 360 and MSN Spaces. Amnesty International and Reporters Without Borders were not available for comment at this time due to temporary technical problems with their Web-based email clients.[26]

PORKIES ON WIKIS

Even seemingly trustworthy on-line dictionaries and encyclopedias can contain wrong information. The Web is a work in progress, as are many so-called authoritative sites. In the United States, Wal-Mart, the CIA and the Mormon Church were caught out adjusting entries to more positively reflect themselves on Wikipedia. Someone was also busted trying to sanitise an article about the 1979 Erebus crash.

The article about the airline's part in what has been described as the worst peacetime disaster was altered to state "pilots are divided to this day as to whether the responsibility ... should rest with the pilot or the flight planning department" over the deaths of 257 passengers and crew. The alteration, which was later deleted, came from a computer using the Air New Zealand server. Cabinet Minister Jim Anderton said that, if true, the change was 'outrageous [and] entirely erroneous.' It was seen as a case of the airline – now 80 percent owned by the government – trying to improve on history.

The airline's computers were implicated through WikiScanner, a programme devised by self-described American 'destructive technologist' Virgil Griffith to identify the computers making alterations to Wikipedia. The adjustment left unchanged the findings by Justice Peter Mahon's Royal Commission that Air New Zealand executives had been behind an 'orchestrated litany of lies' to cover up the cause of the accident, including disposing of evidence and engaging in subterfuge. It also made no change to the assertion that Mahon's findings remained, even though the Privy Council overturned the result because he had exceeded his powers and denied the airline a fair hearing. Anderton said the alteration suggested that Air New Zealand remained sensitive to allegations of blame for the Erebus crash.[27]

The Wikipedia entry for Prime Minister Helen Clark was protected after several fake edits. One from a New Zealand–based computer said Clark was "once called Horris Edwards Clark but had a sex change after being teased at school most of her life." Captions were also added to her air-brushed photograph, including: "Note that this photograph has been modified to hide Ms Clark's harsh features" and "It should be noted that this picture has been digitally modified – it is NOT a realistic photographic image of what this person looks like." The edits were removed.

Changes to Wikipedia articles caused an outcry in Australia, where Prime Minister John Howard denied ordering his staff to alter articles to reflect more favourably on his government. WikiScanner revealed that people using Australian government computer servers had made thousands of changes to Wikipedia articles.[28]

Certainly the Internet gave a whole new meaning to freedom of expression but that was a double-edged sword. One commentator dubbed the Internet 'the new toilet wall' as it gave people the anonymity to say what they wanted about whoever they wanted as rudely as they

liked. When John Howard decided to be hip and post his first YouTube video he provoked a storm of vitriolic feedback across chat rooms, forums, and discussion sites. "YouTube may look like a video-sharing site but it's also much more than that, with viewers invited to become instant critics by posting responses and then engaging with other people watching the same video. Those who saw Howard's less-than-scintillating global warming policy speech were not impressed. But 'no thanks' is not in the vocabulary of the contemporary poster," said Andrew Stephenson in the *Sydney Morning Herald*.

Critics went over the top, abusing, mocking, even suggesting sexual assault of Howard's family and making hugely defamatory comments about Howard himself. Despite constant purging of obscenities and profanities the comments kept coming. The moderating process itself infuriated many who questioned the right of certain parties to remove their comments, lamenting the end of freedom of speech.

What Howard entered was a world dominated by what Andrew Campbell, a psychologist at the University of Sydney, called 'unaccountability.' Control over YouTube postings is essentially in the hands of the person who uploaded the initial video, although the site said it doesn't permit hate speech. Despite this, YouTube discussions, like those on many other sites, are often free-for-alls where anything can be said, generally with no legal remedy.

"The person feels they don't have any responsibility for what they say. It's kind of a free shot … If I could tell you exactly what I think right now and know there was no consequences whatsoever, why not take the opportunity?" Offered the same free shot, face-to-face in a room with Howard, Campbell speculates a different outcome, as "the human factor comes into it, the body language, the empathy and sympathy [raised] by offending someone directly to their face."

Andrew Keen, author of *The Cult of the Amateur*, believed civic discourse was being corrupted by the bile unleashed. "You go to any public noticeboard or any newspaper site and you can find the most disgraceful and disgusting things … I think there's something about the Internet, which resembles Thomas Hobbes's state of nature where life is nasty, brutish and short and very, very rude, where nobody has really made the effort to come up with a social pact where we all behave in a civilised way." Keen, a former Internet entrepreneur, blamed anonymity and an activist minority who spend their lives arguing and insulting. "I don't think the Internet is intrinsically cursed – I think the problem is anonymity and where you'll find productive, respectful conversation is between people who've revealed who they are," he said.[29]

Shortly after the embarrassing tirade, Howard announced a war to 'clean up' the Internet with a proposed budget of at least A$200 million to filter, censor, and screen Internet users and content. His campaign, he said, was to help parents to protect their children from unseemly content and on-line predators. He also wanted a block or ban on 'terror' and 'violent' web sites. Every Australian family would be provided with a free Internet filter and the federal government would enter an unprecedented partnership with ISPs to filter pornography at the source. Australian Federal Police resources would be boosted immediately to expand checks on Internet chat rooms to detect child predators, and privacy laws masking sex offenders on the Internet would be altered. A 'black list' drawn up by the Australian Communications and Media Authority, which covers Australia-based pornographic and terror sites, would be expanded internationally after consultation with the attorney general and receive 14 additional Internet regulators. Further waves of content control connected to Howard's war on the Internet were expected.[30]

So how do you deal with all these damn lies, statistics, misinformation, and mockery? You could take the John Howard path and try to legislate away the problems with an army of on-line bureaucrats and cyber police, or take advice from Elton John, who wanted the Internet shut down because he believed it was destroying music. He told Britain's *Sun* newspaper:

The Internet has stopped people from going out and being with each other and creating stuff. Instead people sit at home and make their own records, which doesn't bode well for long-term artistic vision. Hopefully the next movement in music will tear down the Internet. It would be great to see the Internet shut down for five years and see what sort of art is produced over that span. I'm sure, as far as music goes, it would be much more interesting than it is today.

The *NZ Herald*'s Sideswipe column picked up the subject. "But hang on, Elton. Didn't you stream your 60th birthday concert at New York's Madison Square Garden live over the Web? And haven't you made your back catalogue available to buy on-line?"[31]

No one, not even the most brilliant scientist alive today, really knows where science is taking us. We are aboard a train which is gathering speed, racing down a track on which there are an unknown number of switches leading to unknown destinations. No scientist is in the engine cab and there may be demons at the switch. Most of society is in the caboose looking backward.
American physicist Ralph Lapp.

We tend to overestimate the near-term impacts of new technologies, and underestimate the long-term impacts.
Roy Amara, president emeritus Institute for the Future.

DIZZYING PACE AHEAD

I asked my core LinkedIn network members to project out five years on the impact of the Internet in New Zealand to help me paint a picture of the potential futures we face. No one thought anything would slow down anytime soon; the dizzying speed of technological change would reach even headier levels over the next few years.

In the ideal world of 2010 New Zealanders would no longer be digitally deprived. We would bounce back from the bottom of the OECD broadband statistics and gain great respect on the world scene for our ability to develop and deliver innovative, high-quality software, services, and a rich raft of cultural content.

In the fantasy mindset TelstraClear and Telecom would agree to work in with the government's unbundled open access OKordian (Orcon-Kordia) fibre network and independent open networks across the country. After a $2 billion injection of government funding, alternative fibre would expand within reach of every business and home, with high-speed wireless infill even in the remotest areas.

Talking about separate mobile, landline, video and Internet access would be 'so yesterday.' New wi-fi–enabled multifunction smart phones with in-built GPS and 500Gb removable disks were the new conduits for true broadband and part of the 'follow me' option, allowing phone, email and video traffic to be accessible wherever and whenever you want. Independent home gateway devices would displace the Internet router, set-top box and DVD recorder by taking free-to-air and pay TV and a range of other services from all the major content providers at speeds of up to 50Mbit/sec broadband.[32]

Access to more affordable bandwidth would open up a realm of endless possibilities for creative Kiwis. Web 2.0 combined with other

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developments encouraged continued experimenting and innovating. On-line, on-demand video was the primary driver opening the way for the new bandwidth economy. However aiming at below 50Mbit/sec in the 2008 Digital Strategy revision was revealed as another major policy failing as the 20–50Mbit/sec delivered to most of the country quickly created another digital divide.

Social networking would drive a raft of advancements as it bridged the three degrees of separation across participating groups. The geographic nature of relationships changed from local to global, forever shifting the way we built friendships and kept in touch with people. Second Life and similar breakthroughs continued to delve deeper into virtual worlds.

Screen technology was thinner and more affordable, with 3D and even holographic technology interfaces in common use. Haptics, the use of sensory receptors to provide information about surfaces and textures with motion feedback and sensory information for games and other applications, made the Internet experience more tactile. While these new ways of human interaction attracted strong support, living solely in a virtual world hadn't found favour; physical meetings and social gatherings remained as popular as ever.

Improved access to huge information resources made the Internet the logical first port of call for researchers, teachers, and students, particularly as libraries, museums, universities, schools, and newspapers placed more of their archival material on-line. Teaching and learning continued to undergo a massive shift as the teacher-classroom-blackboard model was displaced by virtual interactive learning environments with more composite qualifications available from a variety of institutions.

Use of the Internet for remote monitoring and control, including in private households, increased. The DRM battle being waged by big publishers was lost – there were other ways of compensating authors for labour and intellectual property. Competition had lowered profits on current Internet activities deploying 'clip the ticket' services. Traditional telcos knew they must morph into service companies or die.

The new telecomm industry – based on a sophisticated new infrastructure, value-added services and partnerships – became the basis for a hugely lucrative Internet economy. The ability to personalise messages, information, and other services with video and interactivity transformed the way we did business, socialised, used information, communicated, and entertained ourselves. The revenue generated through digital media had far outstripped the revenues from the old telecomm environment.

As the Internet became 'the' major communications medium across the globe, the main focus on the technical and governance side was on improving security and the stability of the network and enhancing cyber law enforcement. There were more reasons than ever for people to subscribe to broadband, and the Internet was more internationalised in every way.

It would take a decade to move fully to IPv6. In the meantime VoIP had entered common use and the old PSTN became less relevant as videoconferencing at the desktop to avoid travel became mainstream. Freeview found limited success as its

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inability to keep pace with the demand for channel space meant more content moved to the Internet. News 'papers' contracted even further as everything went on-line. Cable TV via the Internet up to high-definition quality was mainstream and some 'channels' or lengthy video magazines were even downloaded via RSS. As regulated TV was eaten and phones went onto the Internet, governments around the world were looking at ways to regulate and control it.

While the visionaries in my LinkedIn group largely imagined positive breakthroughs based on big-pipe broadband everywhere, the sceptics suggested fibre-to-the home wouldn't be happening any time soon. In five years' time we might still be stuck with 1990s era copper-based broadband, wishing we'd taken the call for fibre more seriously, unless the government injected some serious cash into the mix.

On the up side though, they suggested communities would become more involved in provisioning their own basic infrastructure to support high-speed communications. Cellular and wireless broadband including WiMax would quickly hit critical mass with global costs coming down, and low-cost or free-access mesh networks appearing in many cities. Connectivity would ultimately be everywhere regardless of how it was achieved. Web content would become richer and more interactive with peer-to-peer services becoming mainstream for content delivery. Email would remain the killer application for the foreseeable future.

If Internet was easier to access everywhere and affordable, people would be more motivated to move on-line, resulting in the provision of more services that were about people and how they operate, rather than technology.

The increasing cost of fuel and power would have a big impact on how we used technology and whether more people worked remotely or from home. Big questions would continue to be raised about how to maintain the quality of life and achieve a work-life balance. Pervasive use of communications technology would also provide an impetus for greater participation in communities, shifting this involvement from an elite few decision makers to true e-democracy.[33]

The facts tended to bear out some of the attempts at prognostication, particularly in relation to the relentless march of technology. In 1996, when the Web was just two years old, there were only 48 million people around the world routinely using the Internet. By 2006 it had escalated to 1.1 billion users[34] and by July 2007 another 730 million surfers had subscribed, meaning 17.8 percent of the world population now had Internet access.[35]

The Web had 1.8 billion pages in 2000 and by 2007 this had escalated to around 135 billion pages.[36] Phenomenal growth was continuing beyond anyone's expectations, with research group IDC predicting another 500 million users would be added by 2010.

In 2007 more than 60 percent of the world's Internet users had access to broadband speeds (2Mbit/sec and beyond) either at home, work, or school. The number of email mailboxes had grown from 253 million in 1998 to nearly 1.6 billion in 2006. During the same period, the number of emails sent grew three times faster than the number of people emailing; in 2006 the total person-to-person email traffic, excluding spam, accounted for 6 exabytes (six million gigabytes) of data.[37]

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Reports on bandwidth requirements suggested 5Mbit/sec Internet didn't even come close to meeting the needs of our immediate future; as files got larger and business dependence on high-speed infrastructure became greater, even 20Mbit/sec would soon seem lame.

Certainly a new wave of Web 2.0 applications was on the way that would take interactivity and information management to the next level. There would be personalised tools to track all our banking, finances, and spending, with alerts on reaching certain thresholds; a single interface to track and monitor all our social networking and blogging subscriptions across sites; tools to manage all our travel from flights to accommodation and subsequent destinations, with maps and clear instructions. New messaging sites would bring all the communications types into a single window.

And computing power was still on a steep curve. A decade earlier, the fastest multimedia PCs operated at speeds of 450–600MHz with 512Mb RAM and 8–20Gb hard drives and were considered huge. Today's pocket PCs, smartphones and mobile media players come with many times that storage and PCs have clocked that level of processing power many times over.

Gordon Moore, the unassuming billionaire co-founder of chip giant Intel, said the technology maxim bearing his name was drawing to a close, but could still be a decade away. Moore's Law had for more than 40 years dictated the pace of change in the technology industry, based on his observation in 1965 that the number of transistors on a computer chip would double roughly every two years. But now Intel and the rest of the industry had made features on chips so small, they were running out of space to cram in more transistors and literally bumping against the laws of physics.[39]

Its biggest breakthrough in the basic building blocks of semiconductors in more than 40 years came through a process that used an element called hafnium and metal gates in its chip-making processes, enabling it to etch circuitry nearly 200 times smaller than a red blood cell. This meant Moore's Law could continue for now. Intel began production in October 2007 on a new NZ$4 billion factory in Arizona to mass-produce the Penryn microchip with circuits just 45 nanometres wide – a nanometre is a billionth of a metre – compared to the 65 nanometres in current use. Smaller circuits mean higher computing speeds and lower energy consumption. Penryn chips will be used in the next generation of desktops, laptops, and servers. Intel's innovation is just the latest in its attempts to keep ahead of arch rival Advanced Micro Devices, which was also expected to move to 45 nanometres in 2008.[40]

New heat-assisted magnetic recording (HAMR) technology increases the amount of data that can be written to a magnetic surface by hundredfold and Seagate is promising a minimum 5 terabyte hard drive by 2010. Also keep an eye out for table-top computing, where the screen image from a computer can be projected onto a table top or in fact any flat surface.

Destined for imminent commercial release are display screens that can be rolled out like scrolls and placed on a wall or a flat surface using flexible polymer technology with liquid crystals beneath a layer of unshatterable flexible plastic. These displays are cheaper to manufacture than current flat panel

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displays and can simply be rolled up and placed in your pocket.

Then there's the new Microvision Pico pocket-projector–equipped cellphone, which can display full-colour images from a tiny laser beam. There's also likely to be a revolution in printing with built-in printers coming to all mobile devices from about 2010 using a new technology called Zink (zero ink) and a new paper technology from Polaroid. The colours are already in the paper, which will pick up the image from your new slim printer device.[41]

I was stunned, on a visit to Weta Studios in Miramar in November, when chief executive Richard Taylor handed me several intricate models: a mesh of moving cogs, a highly detailed dragon's head, and a small wheel and hub structure where the outer tyre felt like rubber and was removable. Moulded or extruded? No, printed on a leading-edge hi-tech machine that delivered output in 3D. In about five years, he assured me, consumer-level devices that can print out 3D photographs of family members, for example, will be selling for around $5000.

And of course miniaturisation will continue, even at the sub-atomic level. Nanotechnology, the science of creating and working with materials about one nanometre wide, or one-billionth of a metre, holds the promise of building miniature machines atom by atom, just as every living thing begins with one cell. It has been hailed as the science of the future, with micro-particles already powering innovations that remove lines from faces, strengthen beer bottles, and clean clothing without water. In the laboratory, for example, normal carbon atoms can be fixed into tubelike shapes, called nanotubes, which are 100 times stronger than steel and only one-sixth its weight. Such tampering could bring new, lighter power to a golf club, for example, or to weapons.[42]

Meanwhile the Internet is heading into outer space. The US military plans to launch an Internet router into space in 2009 in a project that could also benefit civilian broadband satellite communications. Cisco and Intelsat are among the companies selected by the US Department of Defence for its Internet Routing In Space (IRIS) project. Potential nonmilitary benefits of the IRIS programme includes the ability to route IP traffic between satellites in space in much the same way packets are moved on the ground, reducing delays, saving on capacity, and offering greater networking flexibility.[43]

BACK TO EARTH

Maurice Williamson, the former communications minister who oversaw market development post-deregulation, was still as passionate as ever about the next big thing in 2007. He continued to push the boundaries with his 24-inch widescreen LCD – running as many applications as possible – and talked in a conspiratorial tone about the amazing possibilities as computing and communications took the next leap forward.

"Do you know computer processors today are currently slower than the brain of a mosquito? If the rate continues doubling it will catch the human brain around 2018 and you will be able to put microchips into everyday devices like microwave ovens and fridges and freezers and vacuum cleaners and lawnmowers, giving them more intelligence than the human being that owns them."

Williamson believed a paradigm shift was coming, with Intel announcing

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the first chip doing a trillion calculations a second. "The more I keep looking at the research and listening to people like Ray Kurzweil[44] about what's going on worldwide about the architecture of the brain – probably the most misunderstood object on the planet – I am confident within 20, maybe 30 years the intelligence you'll be able to put on board microchips will probably be more superior to the intelligence of an individual human being."

Stanley, the Tuareg Volkswagen that drove a 280km pre-planned course in the Nevada Desert despite all manner of obstacles – without one human being aboard – isn't even the start of this. "If we can get to the point where cars are in contact with each other, and using GPS satellites, they will know before they get to an intersection for at least three to four kilometres that there's going to be a logging truck coming at the same time. If the tyres are passing back information to the CPU saying: 'I'm picking up a a drop in coefficient of friction here because the road's getting a bit greasier and slipperier and I'm going to drop my speed a little bit.' Stuff that no human being even knows about, let alone can correct for."

And, claimed Williamson, the breakthroughs attributed to New Zealand–born Nobel Prize–winning scientist, (the late) Alan McDiarmid in long-run polymer electronics, plastics, and rubbers suggests intelligence in car tyres that will be able to talk wirelessly to the car computer. "If there is some slipperiness the tyres may be able to inform (the car's computer system) what it should be doing to correct for that."

John Hine has been watching that curve since the 1980s. "I had a PC at home 20 years ago and was very proud of my 20Mb hard disk. Where will that be in 2020? We're all going to be able to store the whole country's data on our own desktop. I went to listen to Professor Serge Demidenko, from the Institute of Technology and Engineering, giving a lecture, entitled 'Taming the Electronic Beast: New Challenges in the Electronics and Semiconductor Industries' at Massey University and he was saying we now produce 90 million transistors for every human being on earth. That's 20 percent of the neurons in the human body. It makes you sit back and ask where are we going with all of this? I've been scared off from even trying to answer questions like that; it's hard to even predict three years ahead now," said Hine.

MARKETING GOSSIP

The Internet is a great connector. Initially newsgroups were created as tools for collaboration on Internet-related technical projects where people could share ideas in a common space. It wasn't long before far more than code was being worked on, social interaction became a major driver starting with a common interest among computer scientists in sci-fi, notably the *Star Wars* phenomenon. Soon Newsnet or newsgroup hierarchies were expanding to accommodate every kind of hobby and interest imaginable until there were more than 30,000.

The bulletin boards systems of the 1970s and 1980s created the same sense of on-line community and were gradually supplanted by discussion groups, Web forums and Weblogs. Today the social networking phenomenon has taken the world by storm and the tools being used are breaking down even more boundaries for like-minded people to find each other and develop on-line relationships.

Google admitted the main reason it bought YouTube, when it had its own highly impressive Google Video product, was not the numbers who turned up each day but the sense of community, the social aspects, the connections between members. Rather than programmers or content providers pushing content out to a passive audience, market trends were revealing the true power of consumers; they blog, podcast, email, text and chat on the phone, in chatrooms and in discussion spaces. They share ideas, criticisms, feedback and rate songs, movies, TV shows, fashion and forward information, film clips, music, articles and Weblinks to each other.

In fact YouTube had become a self-organising network feeding into the success of new brands and entertainment products and pushing dozens of new entrants into the pop charts. Once word gets out about something hot, and as users agree on worthwhile discoveries they rapidly reach what is known as 'tipping point.' The same principle of momentum applied to Flickr, Bebo, Facebook, and other emerging sites.

The Internet and the various platforms it is now available on, and the desire for connection particularly among youth, has stimulated an explosion of communication across all known barriers. What began as simply peer-to-peer file-sharing tools and chat rooms has become a full-blown environment. As with the bulletin boards and texting, youth-driven fads have quickly spawned a widespread intergenerational trend, with social networking now gaining appeal beyond the MTV generation, with businesses and politicians now taking a serious interest.[45]

MONKEYING AROUND

The idea of connectivity has always fascinated me both scientifically and mystically. I love those serendipitous moments when, through chance encounters, amazing outcomes are realised. Right place, right time – right? Or is there something else at work here? Does thinking make it so? Does being aware of what you would like to happen act as a kind of attractor or at least enhance your awareness of previously elusive possibilities? If we believe the Internet enables like-minded people to find each other, why should we be so surprised when they do and something greater than the sum of the parts occurs?

I had an early fascination with the One Hundredth Monkey theory initially outlined in Lyall Watson's 1979 book *Lifetide* and later reprinted and popularised in an anti-nuclear pamphlet by Ken Keyes Jr.[46] It seemed to offer intriguing insights into collective behaviour, suggesting there was a point of critical mass where a good idea became contagious and could facilitate major social change.

The story itself was eerily empowering. It suggested there was a point in the evolution of an idea, an invention or a new way of doing things, that having gained traction, could, under the right conditions, spread like wildfire.

The Japanese monkey known as Macaca Fuscata was observed in the wilds on a number of islands over a period of 30 years. In 1952 on the island of Koshima scientists were providing monkeys with sweet potatoes dropped in the sand. The monkeys liked the taste of the raw sweet potatoes but found the sand unpleasant. An 18-month-old female, named Imo by the scientists, discovered that washing the potatoes in a nearby stream solved the problem. Her revelation began to catch on and before long she had started a monkey revolution. Imo taught the trick to her mother. Her playmates also picked it up and taught their mothers.

Between 1952 and 1958 all the young monkeys learned to wash their potatoes to make them more edible. But only the adults who imitated their children learned this improvement, the rest kept eating the sandy potatoes. A further learning curve had the monkeys swap from the stream to the sea to wash their

potatoes as this obviously added something to the taste. Then in the autumn of 1958 something startling began to take place. A certain number of monkeys were washing sweet potatoes at water's edge on Koshima Island. This is where the 100th monkey bit comes in.

Suppose at that time there were 90 monkeys engaged in potato washing, then one of the more stubborn beasts who had resisted this newfangled idea had a change of mind. He ambled up to the shoreline to grab his share of the scientist's gifts and joined his companions washing off the sand before eating. Then it happened. It was as if this extra animal – the 100th Monkey – by mere agreement to the new trend had made it universally accepted. The next evening almost every monkey on the island was washing their potatoes before eating them.

The added impetus of the 100th monkey somehow created an ideological breakthrough – a critical mass had broken some link with tradition and created a revolution. Then the most surprising thing of all occurred. Instead of the phenomenon being limited only to Koshima Island it jumped over the sea to colonies of monkeys on other islands including the main troop on the island of Takasakiyama.[47]

Watson, who has a PhD in ethnology for work done at the London Zoo with Desmond Morris, author of *The Naked Ape*, was writing about studies of Japanese macaques done in the 1960s by several Japanese primatologists. He alleged that the scientists were "reluctant to publish the whole story for fear of ridicule" so he had to "gather the rest of the story from personal anecdotes and bits of folklore among primate researchers, because most of them are still not quite sure what happened."[48]

Ron Amundson debunked Watson's claim in 1985.[49] Senior scientists involved in the work denied ever meeting Watson or that there was any corroborating folklore surrounding the monkey experiment. In his response in the *Whole Earth Review* in 1986, Watson said his data came from "off-the-record conversations with those familiar with the potato-washing work." He also admitted the 'One Hundredth Monkey' story was "a metaphor of my own making," based "on very slim evidence and a great deal of hearsay. I have never pretended otherwise…"

Watson had exaggerated actual research for a thinly veiled parable which was hijacked by New Age gurus and educators and passed on like some Internet chain letter as scientific fact. I had used elements of his 'parable' to enthuse people about a range of ideas since I first read it in the early 1980s; I wondered if this theory had something in common with how ideas, trends, and fashions spread through human culture. On discovering it was urban mythology, I reluctantly let the story go, as the facts dictated I must. However, the impression it had made on me lingered and was aroused again when I read about the 'six degrees of separation.'

Mathematicians had apparently been toying with the probabilities of how connected people were. If you could choose any two people in the world at random, how many acquaintances would be needed to create a chain between them? Ithiel de Sola Pool at the Massachusetts Institute of Technology and Manfred Kochen of IBM collaborated on models to look into the theory but never made any significant headway. Then Stanley Milgram, a social psychologist from Yale University who had conducted controversial experiments on 'the conflict between obedience to authority and personal conscience,' conducted his own experiment on connectedness.

Milgram mailed a folder containing a letter to 200 people in Omaha, Nebraska, and 100 people in Boston who were told to forward the letter to one personal contact in an effort to try to reach a target person in Boston. The letter included this specific condition: "If you do not know the target person on a personal basis, do not try to contact him directly. Instead, mail this folder to a personal acquaintance who is more likely than you to know the target person."[50]

His experiment in 1967 validated elements of the theory which suggested that by association with any group of six people you could be connected to millions of others. Milgram, who died in 1984, called his study the Small World Problem and wound up with 60 completed chains of letters that averaged six senders. While he never used the term 'six degrees of separation' in his works, the term and his findings were popularised by the John Guare play *Six Degrees of Separation* (and later the film) and by the trivia game *Six Degrees of Kevin Bacon*, which challenged players to find the shortest list of movie casts linking Bacon to any other actor.

Stanley Milgram's experiment suggested to him that in the United States anyway, everyone was connected within six friendship links. He reported his findings in the first issue of *Psychology Today* back in 1967. However Professor Judith Kleinfield, writing in the same magazine in the March–April 2002 issue 40 years later – after examining Milgram's papers in the Yale University library – claimed his idea of six degrees of separation "may in fact be wrong, or the academic equivalent of an urban myth."

"What I found was disconcerting. Very few of his folders reached their targets. In his first, unpublished study, only three of 60 letters – 5 percent – made it. Even in Milgram's published studies, less than 30 percent of the folders got through. Since then, only a few replications that actually spanned cities have been done. Of these trials, few folders made it through, especially across class and race boundaries. Perhaps people didn't bother sending the letters on. That was Milgram's explanation. But that seems unlikely. The folder was not a simple chain letter, but an official-looking document with heavy blue binding and a gold logo. If the subjects knew how to reach the targets, they probably would have."[52]

WEB DEGREES FOUND

Scientists in 2000 claimed the World Wide Web was developing according to the same organising patterns and mathematical principles observed among plant life in the wild. Rather than how many billion pages comprised the Web, they came to believe it was best measured by the average number of connections it took to link any two random sites. This resulted in the '19 clicks of separation' theory, a scientific effort to help reveal the organic way in which the global network was growing.

Like the 'six degrees of separation' social connectedness theory, researchers at the University of Notre Dame estimated that any two randomly selected sites were connected, on average, by 19 clicks. "Based on this kind of information, we can construct more effective search engines," said Hawoong Jeong, one of the Notre Dame scientists who claimed search engines typically covered less than one-fifth of all publicly indexed sites. While fascinating, other scientists believed it wasn't particularly helpful. Oren Etzioni, developer of the search engine Metacrawler, said that wasn't how people used the Web. He was more interested in their research on Web growth, which indicated something mysterious.

The Web is a lot like a living plant and for some unknown reason was developing along the same mathematical principles that govern the organic development of plants in the natural world. "It was a complete surprise for us," said Albert-Laszlo Barabasi, a physicist at Notre Dame and principal investigator for the team that reported the '19 clicks' findings. He and his students had in 1999 set loose a 'robot' search engine on portions of the Web to tally links and measure how far away each was from the other. Everyone expected the robot to encounter a simple, exponentially increasing number of links based on the assumption that links were distributed randomly. Instead the data clearly showed the links were distributed according to a more sophisticated and self-organising mathematical principle known as the 'power-tail law.'

Another team of researchers, at Xerox Palo Alto Research Center, found the same growth pattern on the Web through a different method of analysis. "It's just like the growth of a tree," said

Bernardo Huberman. "The more pages a site has, the more likely it is that more pages will be added to it." Just as the number of branches on a tree limb is greater near the trunk than out at the tip, growth on the Web takes place so that links with more associated links (or branches) end up closer to the Web's 'trunk.' The point is that the Web's growth appears to follow some of the same natural laws at work in ecological systems.

"What's most interesting is how the Web's structure has evolved without any central authority," said Steve Lawrence, a computer scientist at Princeton University and at NEC, who is internationally recognised for his work on Web information distribution and access. 'It's ending up with a high degree of structure' and somehow creating that structure on its own. The key to getting better search engines, many Web experts claimed, was to better understand how the Web was organised, understand why it's growing like a weed, and how to use that knowledge to improve our ability to find information.[53]

Then another team of researchers began to add further credence to the entrancing myth, claiming to have found that the circuits that make up computers, the computers that make up the Internet, and the people that make up a country all shared six degrees of separation.

Pages on the Internet were connected with hyperlinks, and people in a social network were linked because they knew each other. In an electronic device a link exists if two elements are physically connected. The 'small world' trait found in all three of these types of networks allowed information "to transfer very quickly since a small number of jumps connects any two elements," said Ricard Solé, a professor at the Technical University of Catalonia in Spain and an external professor at the Santa Fe Institute.

Complicated networks like the Internet and social circles share several traits, including the ability to transmit information from one node to any other node in six or fewer steps or hops between neighbouring nodes. Computer circuits, like these other complicated networks, were also scale-free, meaning they consisted of a few nodes, or components with many connections and many nodes with just a few connections. The findings, according to Solé, could point to ways of designing circuits that fail less often – an important trait for systems used in space exploration, for example.

The work also emphasised a trend; researchers were finding similar patterns in many places. "We look for patterns in complex networks, both natural and artificial, in order to see if universal [patterns] are present," said Solé. Electronic circuits were a good place to look because they included intrinsic features that result from conflicts between the needs for low cost and high performance. 'Something like that also occurs in natural systems,' where systems compete for survival over time, he said.

The researchers analysed electronic circuits ranging from an old television made up of resistors, capacitors, and diodes soldered together on a circuit board to a digital microchip containing thousands of components. What they found was that as circuits get larger, they look more like the Internet. "There is a pattern of organisation in real circuits that reveals a process of optimisation as circuit complexity increases," said Solé. Although circuits are designed to be efficient, "interestingly, there is another feature that has not been designed and that is also present." The scale-free structure, with most components having just a few links to other components and a few components having many links, was not designed consciously.

In studies of scale-free node distribution in the Internet, researchers found "the Internet is extremely resilient to removal of randomly chosen nodes, but very fragile when highly connected nodes are attacked." More fault-tolerant circuits could be designed by taking advantage of global attributes like small world connections and scale-free distribution. "A standard device will, of course, fail if a single unit fails, but a new generation of adaptive configurable circuits might take advantage of these properties in order to reach very high levels of stability against random failures."[54]

SIX DEGREES OF EMAIL

Meanwhile a team of sociologists at Columbia University led by Duncan Watts, an assistant professor of sociology and author of *Small Worlds: The Dynamics of Networks Between Order and Randomness*, began trying to assess the six-degrees hypothesis on a large scale, using email as the medium for building the chains.

The researchers hoped to not only learn how social networks were structured, but also whether useful parallels could be drawn between human social Webs and engineered systems such as distributed computer networks. Watts and his team sent out thousands of email messages to target individuals around the world. The goal was to wind up with hundreds of completed chains per target.

He wasn't convinced that Stanley Milgram's findings had been firmly established, 'either theoretically or empirically.' His pool of participants was too small to draw universal conclusions and not all the participants were randomly selected. So the Columbia University researchers set out to fill in the blanks by carrying out a larger, more detailed experiment over the Internet. The study prompted 24,163 email volunteers to attempt to reach one of 18 target persons in 13 countries by forwarding messages to acquaintances, and resulted in 384 messages reaching their target.

The experiment confirmed that a message initiated by a random person reaches its destination in five to seven steps. However it also showed that the primary avenues were not necessarily the highly connected social hubs that Milgram's experiments pointed to. Participants in Columbia's message chains that reached their targets were less likely to send messages to hubs (1.6 percent versus 8.2 percent) than those in incomplete chains.

The main reasons for choosing the next person in a message chain were geographical and work related, and those people tended to be acquaintances rather than friends. The results could improve knowledge bases and peer-to-peer network design, according to the researchers.[55]

In his presentations Watts asked, "How small is the actual world and what would it take for any world at all to be small?" He suggested small world networks should be everywhere and that lots of important problems could be represented as networks from business and markets to economies, friendships, disease transmission, ecosystems, and historical events. In fact any system comprising many individuals between which some relationship could be defined and mapped as a network. He said a lot could be learned from collective behaviour and what happened when lots of people, each following their own rules, interacted. "Physicists, sociologists, mathematicians, biologists, computer scientists, and economists can all help, and all need help." Interdisciplinary work was hard for specialists. "The jury is still out, but there is hope … perhaps the Science of Networks will be the first science of the 21st century," said Watts.[56]

Because New Zealand is becoming increasingly connected, the analogy of the six degrees has reached common parlance here, but according to number, eight wire principals had been customised. Telecom for example was now separated by three degrees. HiGrowth executive director Garth Biggs said in a *CIO* magazine profile in March 2006 that six degrees of separation was too wide a net for the New Zealand ICT community, with its estimated 41,000 members. "My theory is that there are about three, maybe four degrees of separation. People know what projects you've done or know someone who knows what projects you've done and how well you've done. You can't get away from your reputation."[57] Social anthropologist Rob Allen, responsible for innovative approaches to teaching, learning and assessment at AUT, said New Zealand was heaven for someone interested in social networks analysis and concluded the country could boast 'two degrees of separation' rather than the theoretical six.[58]

VIRAL BEHAVIOUR

Malcolm Gladwell in his book *The Tipping Point* talks about the importance of the connector, the cheerleader, the maven[59], the networker and the salesperson, each of whom has an important place in the viral process of spreading ideas, and knowledge in real-world social networking. While appreciating Stanley Milgram's small world experiment, he suggested one of the key points was missed. When Milgram analysed his experiment, he found many of the chains from Omaha, Nebraska, to a stockbroker who worked in Boston but lived in Sharon, Massachusetts, followed the same asymmetrical pattern.

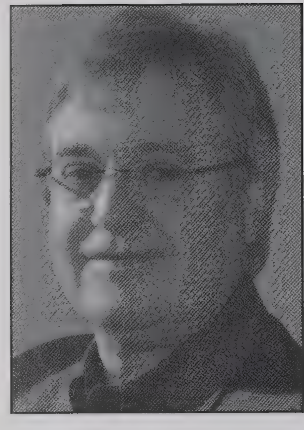
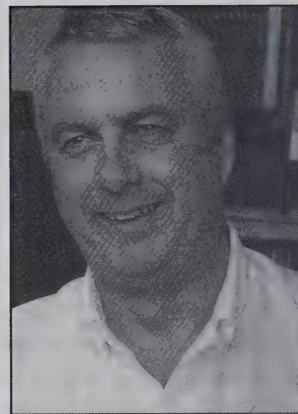
> *24 letters reached the stockbroker at his home in Sharon, and of those 16 were given to him by the same person, a clothing merchant Milgram calls Mr Jacobs. The balance of the letters came to the stockbroker at his office, and of those the majority came through two other men, whom Milgram calls Mr Brown and Mr Jones. In all, half the responses ... were delivered by these same three people ... Six degrees of separation doesn't mean everyone is linked to everyone else in just six steps. It means that a very small number of people are linked to everyone else in a few steps and the rest of us are linked to the world by those special few.*[60]

Gladwell is a firm believer that when an idea is transmitted by the right people in the right environment a mass reaction can occur, particularly if enthusiasm can be sustained. He cites many cases in his book about trends and social behaviours that cross a threshold or 'tipping point' and go mainstream.

Among the famous networkers cited was Paul Revere[61] whose warning 'the British are coming,' shouted as he rode on horseback through rural towns north and west of Boston from 18 April 1775, could have been ignored as the rantings of a madman if he didn't know who to take his message to in each town. He was well connected and when he visited the publican or the local judge they believed him and rapidly sent off their own riders to mobilise neighbouring communities to counter the invasion. A rider with the same message who went to other communities but did not have the same connectedness would be virtually ignored.

Another example was John Wesley,[62] by no means the most charismatic leader or necessarily a great theologian, but an organisational genius who started a 'word of mouth epidemic' 200 years ago. He would travel around England and North America delivering open-air sermons to thousands of people. He stayed long enough in each town to rally enthusiastic support, and encourage the formation of groups of 12 who met weekly and stuck to a strict code of conduct. Wesley travelled ceaselessly, often 4000 miles a year on horseback, reinforcing and encouraging. He was a classic connector with ties to many groups. His motto was 'Do all the good you can, to all the people you can, as long as ever you can.' He was able to bring about fundamental change in people's behaviour and beliefs and as a result the Methodist movement grew from 20,000 to 90,000 in the space of six years.[63] Gladding said Wesley showed how small, close-knit groups had the power to magnify the epidemic potential of a message or idea.

Wesley also broke through denominational ranks, making a huge impression on the largely Church of England–based Clapham Sect, which met regularly for mutual support, and became highly influential in their efforts to bring about a new social conscience against corruption and cruelty. Parliamentarian and social reformer William Wilberforce, who persisted over many years in his work to abolish slavery, and Lord Shaftesbury, who campaigned against child labour and for better working conditions and care for the mentally infirm, were both followers of Wesley. Until his own death Wesley kept in regular contact with Wilberforce, encouraging him in his great work to end the lucrative slave trade that had brought wealth to the gentry but much misery to those who were bought and sold like cattle.[64]

ABOVE LEFT TO RIGHT: ICT connector, John Blackham; The late Trevor Eagle, was a strong advocate for the knowledge economy taking on a number of advocacy roles including chairman of the New Zealand High Tech Council, president of ITANZ, chairman of the Computer Software Industry Joint Action Group and committee member of the Technology New Zealand Advisory Board; Peter Macaulay, founder of No. 1 Software, former ITANZ president, Digital Strategy head and (current 2007) InternetNZ president.
Photo: Randal Jackson for CIO *magazine.*

Connectors occupy many different worlds. They have a high connectedness, something intrinsic in their personality, some combination of curiosity, self-confidence, sociability and energy. Within the ICT and Internet community in New Zealand there are many such people, including the late Trevor Eagle,[65] the late Sir Angus Tait,[66] and Sir Gil Simpson. Most of those who I interviewed for this book also qualify, and it is largely through their endeavours that we have such an organised and 'uncapturable' Internet environment.

Who would have imagined that in 2007 that little old New Zealand at the bottom of the world would have achieved such respect in the international Internet community? Its domain name-management policies, its loud voice among those calling for stronger representation for country code managers and its rejection of a proposal for local disputes, copyright, and trademark issues to be settled by some international body gave it huge mana among its peers in Internet governance. The clincher came in November 2007 when it was confirmed that another great Kiwi connector, Peter Dengate Thrush, had aced the top job, taking over from retiring luminary – 'father of the Internet' – Vint Cerf, as chairman of the board of ICANN, the US-based organisation that globally co-ordinates the Internet's unique identifiers.

Another great Kiwi connector within the ICT community is John Blackham, who I have had casual connection with over 20 years since he founded Fact International[67]. He recommended Gladwell's *The Tipping Point* to me and no doubt to many others. He's been a persistent campaigner for improving New Zealand's ICT profile and encouraging and supporting other entrepreneurs. He was a founder of the Software Association, a former director of Trade New Zealand and was on the prime minister's Science and Innovation Advisory Council. He not only runs his own company XSol, but has headed or been part of numerous cross-industry lobby groups interfacing between government and business.

In August 2007 Blackham was selected by Prime Minister Helen Clark as one of three New Zealand representatives on APEC's Business Advisory Council (ABAC). Blackham is well known, well liked and respected and an enthusiastic purveyor of ideas. He convinced me to join LinkedIn

based on the concept of building up trusted relationships between like-minded people. Although I haven't quite figured out how to make the most of this social networking site – last count I only had 54 contacts on board, but apparently they're fairly influential contacts as I am now only three degrees away from about 333,900 others who are loosely related to the wider ICT, arts and media, consulting and visionary community.

Literacy champions. InternetNZ President Peter Macaulay and Councillor Judy Speight (far right and centre), with David Saedi, president and CEO of host organisation Certiport, were among nine people worldwide who honoured in July 2007 for their ongoing efforts in helping to bridge New Zealand's 'digital divide.' They were named 'Champions of Digital Literacy' at the 2007 Champions of Digital Literacy Awards, in Orlando, Florida. Macaulay was honoured for his work with the Government's Digital Strategy, and Speight for her work with the ICT skills programme Accelerating Auckland.

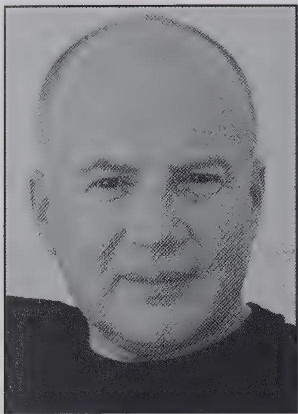
Visionaries, pioneers, and entrepreneurs are the kind of people who often see things coming way before mainstream business or government, and should be first port of call for decision makers before they even consider paying expensive consultants to produce more reports. Typically such people are well informed, and passionate about being in the best shape to meet the future. They have a full business and social life and still find time to get involved in the dozens of lobby groups, think tanks and industry organisations like ICT-NZ, TUANZ, the Software Association, IPENZ, ISPANZ, TCF and of course InternetNZ, whose highest calling is to watch over the evolution of the Internet and bring wise counsel relating to its development.

The new era of mass communications has opened extraordinary doors for sharing information and for innovation that goes way beyond what we might term traditional. If the traditionalists continue to defend against the warnings, exhortations, grand ideas and instincts of the digital visionaries and pioneers we risk ignoring the best early warning system we have, and dampening their natural enthusiasm to carry us through to the next stage.

IN SEARCH OF NETNESS

Peter Macaulay, another tireless connector, who has run businesses, headed industry groups and consulted across the ICT industry for more than 20 years, has a vision for removing all bureaucratic and technological obstacles that prevent the nation's fibre networks from interconnecting. He wants an investment pool created to join the dots for what he calls the 'lily pad effect.'

Macaulay talks about the emerging state of netness,[68] a term that conveys the extent to which individuals are linked to one another, which in itself requires a changed way of thinking. "What we're saying is, you don't need to have all the networks behaving as one. We're getting so smart now that we can actually join things up even when they're not connected; it's already evident in equipment that runs on wireless and mobile networks, and laptop computers that run on five or six different connections. Mine runs on fibre connection in Wellington, on DSL in Auckland and out at the airport and I can choose whether I use my Vodem or wireless."



Saatchi and Saatchi CEO, expat Kiwi Kevin Roberts. Photo: Duncan Cole, Source: www.saatchkevin.com.

He said netness is not just about technology but about relationships, about humans and their capability to build better ways of working. "It's like texting. Kids took to texting when there was no good reason for it, yet it has become pervasive and it doesn't require thinking about. All of us can now pick up a cellphone and send text messages. It's part of our ability to collaborate. It's just another mode of communication where we drop a short message or an email to someone which doesn't require talking. It's a nice layer that fits in between."

More importantly, he said 'netness' is about the ability to collaborate in ways we never have before. "It's about putting people together on a project even though they might be 600km apart and have never met. It's about working with guys who are developing things all over the world, Vint Cerf[69], Gordon Cook,[70] Bob Frankston[71] and all these amazing brains that I can just tap into because someone has decided they want me to be part of that group."

Eventually, Macaulay claimed, we collapse the six degrees of separation because in social communities like LinkedIn, netness makes us two degrees separated from anyone else. "It's actually about developing stuff, where you are working with people who are of a like mind and trying to move in the same direction; you get a synergistic effect. It removes the concept of content from its current tendency to think about it in discreet ways. It becomes part of netness, whether your way of connecting is video, literature or streams of thought."

He said his role was to make sure we were moving as quickly as we could towards netness, and his first priority is connection. "I was always under attack in the Digital Strategy secretariat for failing to balance connection, content, and confidence. My view has always been that there is one big C and two small cs. The big C is connection and the next most important is confidence. Content automatically flows. You can't stop the stuff."

When you provide creative people with the tools to work together they become collaborative and creativeness is enhanced. "The competition side is that human beings will perform better in a competitive environment where people can compete both against themselves and against others. Just watch America's Cup racing: it's a perfect example of a healthy competitive environment and how exciting it gets when people compete in a healthy way. I also put compassion there more because there's a danger we miss out on the people oriented things."

And not everyone is going to be comfortable in this space. "We have to make sure we can reach out to the people who are neither comfortable nor able to use this space and make sure that they get the benefits too. There are always going to be roughly 10 percent of the population who are Luddites,[72] who will never use technology. As we move into netness we have to ensure that those people who have made the choice not to be in the connected world are still able to operate as citizens and function as healthy, creative, good human beings. That's a component that hasn't been taken into consideration at all so far."

And there was no need to fear the changes we are going through as a society. "It's not going to restrict us, it's not going to turn us into zombies or automatons. It's going to allow us to be better human beings, in every aspect. To do this we have to be sure we're not being controlled by governments, corporations, or anyone with the wrong sort of motivation."

DISTRIBUTING THE FUTURE

There have been some hard lessons in New Zealand's Internet history so far. Those who paved the way are mostly still with us, in particular the Internet pioneers who cut through a confusion of protocols and technical obstacles 20 years ago to get the science and research community connected into the wider world. Then there are those intrepid souls who volunteered endless hours as part of the Internet Society, which inherited the labyrinth of domain name management and administrivia that overshadowed its higher calling as caretaker of the Internet for half a decade.

There were the early ISPs who battled against the former state-owned Telecom empire, which despised the Internet until it gained its own foothold and then tried to take control, and of course the competing carriers who struggled on an uneven playing field for so long while successive governments sat on the sidelines refusing to interfere in the free market where nothing was for free. Free market economics did not deliver full and open competition, the government in all its variations did not remove the roadblocks and lead the charge. Through not acting quick enough we gave away our leading edge at a critical time.

This book has been a chance to record the pioneering achievements that enabled us to get this far, to celebrate those who could see what was possible once we got the country connected. They foresaw the possibilities and potential and are still working to build the relationships and join the wires that connect the clouds.

I love the quote "The future has already arrived. It's just not evenly distributed yet," attributed to sci-fi writer William Gibson. But how could I be certain he had in fact strung those provocative words together? I'd spotted the quote on the Internet after all, which was full of mangled monologues and urban legends.[73] The subject of Gibson's alleged quote, and attempts to try and accurately source it, were covered in a Usenet thread in February 2004, in the end revealing it came from an August 1992 interview on the Fresh Air radio programme. Another source has Gibson making the quote: "As I've said many times, the future is already here. It's just not very evenly distributed," on an NPR Talk of the Nation broadcast in 30 November 1999.[74]

Gibson, who coined the term cyberspace in his novel *Neuromancer*, was again being the visionary, and the power of his words were still evocative and inspirational. His economy of speech in that short quote suggested all the pieces to our puzzle were already here; we just needed to put them together in the right way. If we face a connectivity crisis, an identity crisis or a balance of payments crisis, then stepping back and viewing the problem from another angle may present the answers we need. In this case perhaps open fibre access now being rolled out by local authorities and private and public partnerships is an important part of ensuring the future is distributed more equally.

The problem we have been up against is the fortress mentality, the short-term thinking that looks to extract the maximum value in the shortest period of time, whether it's between elections or AGMs. Unfortunately that strip-mining, trawl-netting approach does not take into account the long-term big picture that embraces heritage and culture and a legacy for future generations. Danny Hillis, former vice president of research and development at Disney's Imagineering division and inventor of massively parallel computing, is fascinated with the possibilities that technology presents, but also concerned at our short-term view of the world and our failure to secure the future. He recommends a 'new aesthetic of slowness.'

> *I think of the oak beams in the ceiling of College Hall at New College, Oxford. Last century, when the beams needed replacing, carpenters used oak trees that had been planted in 1386 when the dining hall was first built. The 14th-century builder had planted the trees in anticipation of the time, hundreds of years in the future, when the beams would need replacing. Did the carpenters plant new trees to replace the beams again a few hundred years from now?*[75]

Like Communications Minister David Cunliffe said, the government is responsible for ensuring private interests align with the public good. "I hope Telecom and other market players are coming to realise that a series of short-term profit-maximising decisions must, in the end, be squared away with the long-term national interest."[76]

Of the endless reports that have been delivered to successive governments in an effort to help us lift our game, the one that remains front of mind is the progressive prescription left by Dr Porter in 1991, 1998, and 2001. In his 1998 visit Harvard professor Michael Porter[77] said we had taken the ideology of the free market to the extreme and it had held us back. We needed to find and celebrate an energising national vision which captured our distinctive culture, circumstances, and history.

The country had gone through the painful process of privatising, reducing subsidies, and opening up our markets to the world but had focused on the negative aspects of those changes. Now it needed to look at the positive side, take an energising view of what New Zealand could be, encourage innovation, revitalise science and technology, and differentiate our businesses for economic growth.

That was a decade ago. We should by now be moving rapidly from the industrial era, which was all about making things from raw material and moving physical goods to earn our export income, to an era where we add value to our core assets, analyse and use information and transform it into 'weightless' economy advantages, which can be beamed at light speed to the world. Like our creative culture we need to hear more Kiwi success stories of entrepreneurs and business people who have cracked the international market, and there are far more of them than most of us are aware of.

If business is doing well and there is widespread support for innovation and new ideas we all do well. New jobs are created, wages rise according to the level of confidence of employers and customers, and there is a sense of forging ahead. When there is no business confidence everyone suffers, unemployment rises alongside the crime statistics and Lotto ticket sales and the number of people trawling through each other's garbage on inorganic collection day.

Kevin Roberts, passionate advocate of all things Kiwi and New York–based head of Saatchi and Saatchi, believed New Zealand's location at the edge of the globe gives us a mystical, even biological power but it needs more gravitational pull. This is a country that needs to identify, extract and activate its DNA. He insists we're a nation of five million people, not four, with more Kiwis now living abroad that there are Australians outside Australia.

Harvard professor Michael Porter

Being out on the edge is the most innovative and generative place in any system. "The action is at the margins, where there is freedom to create away from the orthodoxy of the centre. Ideas from New Zealand have advanced the world in many profound ways, but until now we have not had the metaphor and language to harness our unique global position. We've been stuck in a distant-isolated-small mindset and need to turn these factors into leverage.

"The world needs us precisely because we are its edge. This is our role. We need to be emotionally compelling, edgy … Our edge is the ace of hearts, and we must play this card in order to lift ourselves, to inform our risk-taking, to be our best."

Roberts said New Zealand needed to embrace our edge positioning, revel in it and kick-start a global sense of community. "A large number of New Zealanders, including many of our most ambitious, qualified, literate, talented and influential, have left our

economy to test their ambition in others. We need to bring them back emotionally and work together as a global New Zealand family. How can we win the hearts of export markets when we ignore the contribution of our biggest export product – our people – to transforming our underperforming economic effort? Love starts with family. Love will create Aotearoa whanau whanui ki te Aonui – the global community of New Zealanders. Five million of us to take on the world and win."[78]

Our technological literacy, the fact we're a well-educated English-speaking nation, the quality of our innovators, the size and beauty of our underpopulated nation, our time zone which is ahead of the world, our lifestyle, our historical strengths in the primary sector – where we have amassed considerable knowledge – tourism, number 8 wire know-how, and our edgy creativity are our distinctive assets. Even our average temperature at 20 degrees Celcius,[79] according to the anthropologists, is ideal for the human animal to operate optimally.[80]

By all indications the interminable battles for equitable access to infrastructure and a true competitive environment are coming to an end, and the challenge now is to ensure that the new highways reach all citizens. It's time to revisit the question: so what are all these networks for again?

In all the building and rolling out of copper, fibre, wireless and cellular and installing, configuring and achieving dial tone, compatibility, standards, interfaces and endless technology breakthroughs it's easy to lose the end goal. Surely it's to get on with the business of e-government; specifically e-democracy, e-commerce, e-learning, e-health, and all the other 'e' prefixes that streamline, simplify, and eliminate barriers and create efficiencies. Like those first telegraph and telephone lines, broadband will only magnify our ability to connect, create, collaborate, communicate, compete, and show compassion.

AT THE INTERSECTION

In his book the *Medici Effect* Frans Johanssen claimed extraordinary breakthroughs frequently occur at the intersection of apparently unrelated fields or disciplines. His theory is based on the remarkable burst of creativity that occurred when the Medici banking family funded creators from a wide range of disciplines, resulting in sculptors, scientists, poets, philosophers, financiers, painters and architects converging on the city of Florence in 15th century Italy. "There they found each other, learned from each other and broke down the barriers between disciplines and cultures. Together they forged a new world based on new ideas in what became known as the Renaissance. As a result the city became the epicentre of a creative explosion and one of the most innovative eras in history."

He said the convergence of scientific disciplines and the leap into computational power are increasing the types of intersections available today. He gives numerous examples including how the study of ants enhanced telecommunications routing and gave rise to the development of a guidance system for unmanned aerial vehicles. Another intersection example was how Linus Torvalds, a self-taught 21-year-old hacker, created a free open-operating system against all the wisdom of the time. After being tweaked and improved by the on-line community, Linux grew from hundreds to thousands of users, becoming the preferred operating system for many top 500 companies. Johansson believed the intersection of disciplines across business, science, art, politics and cultures can result in revolutionary ideas that inject fresh insights and inspire new discoveries.[81]

We are at a powerful intersection where computing, connectivity, competition, content, comfort, collaboration and compassion can converge. If we don't back the visionaries, the creative people and risk takers who can see beyond the obstacles and break new ground, the same bureaucrats and consultants will continue to insist they know best while producing more reports; endlessly taking minutes and wasting hours. The pipe dream of unbundled triple-play gigabit infostructure can only become reality

when we break the cycle of inaction with clear business plans, empowering vision statements and informed and experienced leadership from business, the community and government.

It's not a case of waiting around for someone else to do something but for each player to do what they can. That might mean connecting public-private open access networks and where necessary adding Telecom and TelstraClear to the mix. If the government can get over its fear of engaging with the private sector and actually commit to a long-term investment in our information highways, an enormous asset could be unleashed. As Macaulay said, the next thing you know everything will soon be a lily pad's leap away from everything else. With that kind of connectivity the obstacles of distance and isolation disappear and we get to discover what we knew all along. It's a small world after all.

The serendipity that existed even prior to the steam age must surely be enhanced and amplified by the connectedness of the information age? Are we ready for the 'steam engining effect'?[82] It only steam engines come steam engining time; in other words when James Watt came up with his steam engine many others were working on similar designs, he just happened to get to the patent office first. It's an extension of Victor Hugo's adage, "An invasion of armies can be resisted but not an idea whose time has come."

Around the world, think tanks, science, research and academic institutes, industries and individuals are eager to leverage each other's mental and computational power in the search for answers to life's great and intriguing problems. In a collaborating and ultimately informed society, ideas like consensus, the power of the people and e-democracy can start to take on real meaning. So what breakthroughs await us in the next decade as sparks of creativity jump across New Zealand's connected communities and out to the great wide network of networks?

Having suffered the humility of being a laggard so long, it's logical that the technology has matured, is more capable and more affordable; that the pioneers are more experienced and resilient, and governments can no longer get away with saying they do not understand, or that the free market will deliver. As we move from the copper-constrained world to the light-speed era of open fibre we have another chance to address the imbalance. At stake is New Zealand's future productivity, prosperity, prospects for advancement on the world stage, and the well-being of our grandchildren.

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Footnotes

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7 In 1837 there were two methods of sending a message along a telegraph line. Wheatstone and Cook's system required two wires and operators at each end; Samuel Morse's invention was the preferred technology because it required only a single wire. Messages could be sent at about 35 words per minute using the Morse code, and up to 45 words per minute using Wheatstone and Cook's apparatus

8 A.C. Wilson, *Wire and Wireless 1890–1987*, Dunmore Press, 1994, pp26–27

9 'The Future With Telecom' report, Telecom 1991

10 A.C. Wilson, p29

11 Airey

12 www.cablebayfarm.co.nz/history2.html

13 *Encyclopaedia of New Zealand*, edited by A.H. McLintock, originally published in 1966. Te Ara - The Encyclopedia of New Zealand, updated 26 September 2006: www.teara.govt.nz/1966/p/postoffice/en

14 Minimum charges for ten-word telegrams in 1868 ranged from a penny a word between nearby stations to eight pence a word for longer routes. A universal rate of one shilling for ten words was adopted in the 1870s. In 1896, sixpence telegrams were adopted to encourage traffic, but by 1915 the postmaster general was speaking publicly of a loss of tuppence on every telegram handled, and the basic rate was increased to eight pence that year and to one shilling in 1920. Charges continued to fluctuate to meet rising costs without noticeable impacting traffic growth. Three and a half million inland telegrams were sent in 1900; 7.25 million in 1920; 4.5 million in 1940; and 7.25 million in 1960. *Te Ara Encyclopedia* 1966: www.treatyofwaitangi.govt.nz/timeline/nz1850.php

15 Sir Julius K.C.M.G Vogel, from *The Encyclopaedia of New Zealand*, 1966

16 Airey, p13, citing articles in the *Nelson Evening Mail* 18 February, 1876 and other media coverage

17 Ibid

18 Replaced in the 1880s by a Siphon Recorder, which meant one person at each end could now handle trans-Tasman communications

19 Airey

20 The cable rate to Great Britain from Sydney was £9 9s 6d for 20 words. Traffic increased when charges were reduced in 1902 with the 'all-red' route, jointly owned by the British, Canadian, Australian, and New Zealand governments. In 1912 a cable was laid between Sydney and Auckland. The Wakapuaka terminal was later abandoned and the cable landed at Titahi Bay near Wellington in 1917. *Te Ara Encyclopedia* 1966

21 Alexander Graham Bell's theory of the telephone confirmed by experiment with the first words spoken on 2 June 1875. The

first telephone patent, number 174,465, was issued on 7 March, 1876. The first complete sentence was transmitted by telephone in Boston three days later. US Patent Number 174,465, issued on March 3 for 'Improvements in Telegraphy.' The first commercial telephone exchange in the world opened at New Haven, Connecticut, 28 January 1878

22 Telecom, press release, Diamond Anniversary of the First International Telephone Service (21 November 1990). Also 'Phone affair began early,' Briar Averill, *Sunday Star Times*, 1 February 1998, commemorating the 120th anniversary of the first long-distance telephone call between Dunedin and Milton

23 'The Future With Telecom' report, Telecom 1991

24 'Speaking Your Language,' Pacific Way, 1991

25 A.C. Wilson, p43

26 www.awunz.org.nz/history.htm

27 A.C. Wilson, p63

28 Post and Telegraph Department Acts 1842–1900 (vol 1) GP Wellington, 100, p262

29 www.teara.govt.nz/1966/P/PostOffice/InlandTelecommunications/en

30 Hugh Barty-King, *Girdle Around the Earth: The Story of Cable & Wireless*, William Heinemann Ltd, London, 1979, cited in Airey, *The Taming of Distance*

31 Cable & Wireless was nationalised by the British government in 1947 and all its assets collapsed into the British Post Office

32 The bulk of this material about the competing cable systems is paraphrased from Elizabeth Airey, *The Taming of Distance*, Dunmore Press, 2005, with permission from the author

33 Hamish Keith, *New Zealand Yesterdays, Readers Digest*, 1984, page 156

34 From a document which has since been removed from the government's Radio Spectrum management web site: www.rsm.govt.nz

35 Keith, p156

36 Ibid

37 From a document which has since been removed from the government's Radio Spectrum management web site: www.rsm.govt.nz

38 Wedderspoon 2003

39 Keith

40 Patrick Day, *The Radio Years – A History of Broadcasting in New Zealand*, Auckland University Press 1994, ISBN 1 86940 094 1

41 Telecom briefing paper, 'What is a Telephone Exchange,' December 1991

42 *Bateman New Zealand Encyclopedia*

43 *Te Ara – The Encyclopedia of New Zealand* 1966 ref Post Office

44 Telecom New Zealand, press release, 21 November 1990, headlined 'Diamond Anniversary of the First International Telephone Service'

45 Caslon Analytics telecommunications history page: www.caslon.com.au/austelecomsprofile1.htm

46 Telecom New Zealand, press release, 21 November 1990, 'Diamond Anniversary of the First International Telephone Service'

47 *Te Ara - The Encyclopedia of New Zealand* 1966 ref Post Office

48 www.atlantic-cable.com/CableCos/NewZealand/index.htm

49 *Te Ara - The Encyclopedia of New Zealand* 1966 ref Post Office

50 There was still some minor use of Morse code through until the 1950s but by the 1962 centennial of its first use in New Zealand it had been superceded by the teleprinter and the telephone. Teleprinters remained in use, one of their main users being the Press Association with its links to various newspapers around the country and as a network of 300 branch-to-branch circuits leased by businesses and government departments. Their use increased from 1964 with automatic telex switching of teleprinter calls on a national network. *Encyclopaedia of New Zealand*, edited by A.H. McLintock, 1966

51 *Te Ara - The Encyclopedia of New Zealand* 1966 ref Post Office

52 *Encyclopaedia of New Zealand*, Post Office, edited by A.H. McLintock, 1966

53 *Te Ara - The Encyclopedia of New Zealand* 1966 ref Post Office

54 *Looking Back to Tomorrow*, New Zealand Computer Society, 1985, pp38

55 *Bateman New Zealand Encyclopedia*

56 Stephen Bell, computer journalist, in *Looking Back to Tomorrow*

57 Philip Burden, Minister of Commerce, keynote speech to TUANZ conference, 10 August 1992

58 www.rand.org/about/history/baran.html

59 The Advanced Research Projects Agency (ARPA) changed its name to Defense Advanced Research Projects Agency (DARPA) in 1971, then back to ARPA in 1993, and back to DARPA in 1996. We refer throughout to DARPA, the current name

60 Lawrence G. Roberts, MIT, *Towards a Co-operative Network of Time-Shared Computers*, October 1966, was the first ARPANET plan

61 'Multiple Computer Networks and Intercomputer Communication,' the first design paper on ARPANET published by Larry Roberts

62 Only the RAND study on secure voice was considered to have the goal of building a network that would be resistant to nuclear attack. This was never the goal of ARPANET, although later work on Internetting did emphasise robustness and survivability, including the ability to withstand losses of large portions of the underlying networks

63 The terms 'hypertext' and 'hyperlink' were coined by Ted Nelson in 1965 to refer to the structure of a computerised information system through which a user can navigate 'non sequentially' or without a pre-structured search path

64 Based on the collaborative historical document located at the US Internet Society home page (www.isoc.org/Internet/history/brief.shtml#Origins), including input from many of the Internet's pioneers and excerpts from technical papers

FOOTNOTES CHAPTER 2

1 *Looking Back to Tomorrow*, New Zealand Computer Society, 1985, pp39
2 A.C. Wilson, p165
3 Ibid p152
4 Ibid, p144
5 Ibid p41
6 *Looking Back to Tomorrow*, New Zealand Computer Society, 1985, pp46–47
7 Where most program data is kept on the stack and queued for greater efficiency rather than having to be called from the software register each time
8 en.wikipedia.org/wiki/Burroughs_large_systems
9 www.cs.waikato.ac.nz/department/history.html
10 Ibid
11 After 15 years development, engineer Harrington became director of the Canterbury Computer Services Department in the mid-1980s
12 The DEC PDP (programmed data processor) was a series of highly successful computers made by DEC
13 en.wikipedia.org/wiki/ALOHAnet
14 Also known as acoustically coupled modems that were mechanically connected to the phone, fitting over the handset to send and receive signals coming down the phone line and convert them into the zeroes and ones of data streams that could be understood by computers. A primitive device that preceded electrically connected modems
15 The Elliot was a British machine. The company was taken over by General Electric and later became ITL
16 By 1977 the DSIR had developed a gateway with IBM 3270 emulation, which was extended to handle SNA in 1980, long before such products were available from vendors. J.H. Hine, 'Research Networks in New Zealand,' Department of Computer Science, Victoria University of Wellington. Technical Report CSD-87-021, 1987
17 Frank March moved from the DSIR to spend a decade as director of Computing Services at Victoria University from 1985
18 J.H. Hine, chapter 6
19 www.cs.waikato.ac.nz/department/history.html
20 Based on the collaborative historical document located at the US Internet Society home page (www.isoc.org/Internet/history/brief.shtml#Origins), including input from many Internet pioneers and excerpts from technical papers
21 Ibid
22 Overseas experience: the semi-obligatory working holiday young people take before settling in to the workforce
23 The IBM System/360 mainframe computer system family announced by IBM on 17 April 1964 were the first to make a clear distinction between architecture and implementation, allowing compatibility across its range of models. Customers could purchase a smaller system with an upgrade path. The 360-67, first shipped in August 1966, came with the CP/CMS operating system, the original virtual machine system developed at IBM's Cambridge Scientific Center, in co-operation with MIT researchers. Ref: en.wikipedia.org/wiki/IBM_360
24 The predecessor to DEC's highly successful PDP-8 aimed it at a market that couldn't afford larger mainframe computers
25 Wilson, p152
26 Ibid, p162–163
27 A young punk anarchist was killed on 18 November 1982, apparently blown up by his own gelignite bomb while trying to breach security at the computer centre. The bomber, 22-year-old Neil Roberts, had the words "This Punk won't see 23. No Future" tattooed across his chest
28 www.atlantic-cable.com/CableCos/NewZealand/index.htm
29 Development was prevented but ten years later Bastion Point land was returned to Ngati Whatua
30 Colin Beardon, *Computer Culture*, Reed Methuen, 1985
31 The first international standard packet switching network was developed in the early 1970s and published in 1976 by the CCITT (now ITU). X.25 was designed to become a worldwide public data network similar to the global telephone system for voice, but it never came to pass due to incompatibilities and the lack of interest within the US. It has been used primarily outside the United States for low-speed applications (up to 56kbit/sec) such as credit card verifications, automatic teller machine (ATM) and other financial transactions. X.25 provides a connection-oriented technology for transmission over highly error-prone facilities, which were more common when it was first introduced. Error checking is performed at each node, which can slow overall throughput and renders X.25 incapable of handling real-time voice and video. Source: www.pcmag.com/encyclopedia
32 Wilson, p173
33 Wilson, p174
34 www.paymark.co.nz
35 Wilson, p175
36 Vivienne Smith, *Reining in the Dinosaur: The remarkable turnaround of New Zealand Post*, New Zealand Post, 1997, p23
37 Wilson, p174
38 Ian Duncan and Alan Bollard, *Corporatisation and Privatisation: Lessons from New Zealand*, Oxford University Press, Auckland, 1992, p7
39 'Economic management,' The Treasury, Wellington, 14 July 1984, p275, p279.
40 Smith, pp43–45
41 The Mason-Morris review began in September 1985
42 Smith, p44
43 Ibid, pp45–46

FOOTNOTES CHAPTER 3

1 Vint Cerf quoted in various technical media, Wednesday 1 January 2003
2 Bitnet came to mean 'Because It's Time Network,' although the original meaning was 'Because It's There Network'
3 At its peak around 1991, Bitnet extended to around 500 organisations and 3,000 nodes within educational institutions. It spanned North America, Europe and some Persian Gulf states but as TCP/IP systems reached maturity and the Internet went

mainstream in the early 1990s its popularity rapidly diminished. en.wikipedia.org/wiki/BITNET
4 This increased to a 2Mbit/sec backbone with 64kbit/sec access links in the mid-1980s
5 Paraphrased from en.wikipedia.org/wiki/JANET
6 www.pcmag.com/encyclopedia
7 Distilled from *A Brief History of the Internet* by Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts, Stephen Wolff: www.isoc.org/Internet/history/brief.shtml
8 This was upgraded to 1.5Mbit/sec by 1988
9 When the strain of the burgeoning ARPANET began stretching the resources provided voluntarily by the larger UUCP hubs in the United States, Rick Adams, a systems administrator at the Centre for Seismic Studies, began looking at a way for commercial organisations to alleviate the burden. UUNET Communications Services began operation in 1987 as a non-profit corporation providing Usenet feeds, email exchange and access to a large repository of software source code and related information. It shed its non-profit status within two years and changed its name to UUNET Technologies. From 2006 UUNET became an internal brand of Verizon business (formerly MCI). Source: en.wikipedia.org/wiki/UUNET
10 Edited from the research of Richard T. Griffiths, Leiden University: www.let.leidenuniv.nl/history/ivh/chap2.htm
11 Distilled from *A Brief History of the Internet*
12 NWG, RFC 722, Jack Haverty (MIT), September 1976
13 REXX (REstructured eXtended eXecutor), an interpreted programming language was developed at IBM. It was designed to be both easy to learn and easy to read
14 The company best known for its work on packet switching, ARPANET and the Internet was acquired by GTE in 1998, then GTE and Bell Labs merged to become Verizon in 2000. BBN has been in private hands since 2006. en.wikipedia.org/wiki/Bolt,_Beranek_and_Newman
15 Eric S. Raymond, Origins and History of Unix, 1969–1995, 2003: www.faqs.org/docs/artu/index.html
16 Andrew Leonard, BSD *Unix: Power to the People, from the Code*, 2000
17 Culled from *A Brief History of Unix* by Charles Severance: www.hsrl.rutgers.edu/ug/unix_history.html and en.wikipedia.org/wiki/Unix with a nod to Origins and History of Unix, 1969–1995: www.faqs.org/docs/artu/index.html, Eric S Raymond, 2003
18 Robert Biddle, formerly of Canterbury University Computer Science Department, in a posting to the nz.general newsgroup, 19 April 1994
19 Biddle chose Cantaur because he expected 'canterbury' would one day become a domain name: "Cantuar was also the official abbreviation for the Latin name the Commonwealth Universities Office used for the university, cantuariensis. If you had a BSc from there, you would write J. Bloggs, BSc (Cantuar). A few years later they did away with Latin and made the abbrev 'cant' instead. I was disappointed when I got flamed from many places for having a site name that people though was based on centaur spelled wrong."
20 In Unix and other computer multitasking operating systems, a daemon is a computer program that runs in the background, rather than under the direct control of a user and is usually initiated as a process. The term was coined by the programmers of MIT's Project MAC and derived from Maxwell's daemon, an imaginary being from a famous thought experiment that constantly works in the background, sorting molecules. Daemons are also characters in Greek mythology, some of whom handled tasks that the gods couldn't be bothered with. Source: en.wikipedia.org/wiki/Daemon_(computer_software)
21 Robert Biddle
22 Ibid
23 Ibid
24 In 2007, head of the School of Mathematics, Statistics and Computer Science.
25 en.wikipedia.org/wiki/PDP-8
26 Minutes of the 26 August 1985 meeting called to discuss university networking, taken by John Hine
27 John H. Hine, Research Networks in New Zealand Technical Report CS-TR-87-021, 12 September 1997
28 Brian Peace was the first chairman of NZUSUG
29 An IBM topology for local area network connections in which all the computers are connected in a star or ring and use a bit or token-passing scheme to prevent the collision of data when messages are being sent concurrently. Token Ring was quickly surpassed by Ethernet on most networks as local area networking came of age
30 The Unix gateway in Maryland was deemed an experiment that might last only a year but in fact it lasted forever, became Altanet, was subsequently bought out by MCI and then later by Worldcom and finally Verizon (Houlker)
31 Cyberspace was a term coined by William Gibson in his 1984 novel *Neuromancer*, in which he described a futuristic computer network that people could plug their minds into. The term quickly became synonymous with the Internet or on-line world
32 The emacs editor is arguably the editor of choice among many software engineers and referred to as the code cutter's Swiss army knife
33 Lisp, from 'list processing,' originally created as a practical mathematical notation for computer programs. It was one of the earliest programming languages, pioneering many ideas in computer science including tree data structures, automatic storage management dynamic typing, object oriented programming and the self hosting compiler. Linked lists are one of Lisp's major data structures and Link source code itself is made up of lists. List programs can manipulate source code as a data structure. en.wikipedia.org/wiki/Lisp_%28programming_language%29
34 A DNS software package for Unix/Linux machines. It contains a DNS server, API library and tools. Most of the DNS servers on the Internet run Bind
35 Hine
36 Tony McGregor, History of the Internet debate on NZNog

newsgroups, March 2001
37 Hine
38 Everyone knows a classicist is about as far away from computing as you can possibly get. What happened, says March, was as soon as he was appointed, somebody went and dumped a Macintosh on his desk, and he became a computing aficionado
39 Report of the Committee on Information and Computer Services, November 1985, Professor Chris Deardon, 3.2.1b
40 Ibid 4.1.1,
41 Ibid 4.2.1, 4.2.2
42 Ibid 4.7.2
43 Ibid 5.1
44 Ibid 5.3.9
45 Hine
46 Ibid
47 Ibid
48 In the US DARPA funds the ARPANET. CSNET received five years of support from the US National Science Foundation (NSF). Bitnet received substantial support from IBM. Janet in Great Britain was funded by the Computer Board and Research Councils. Japan's JUNET is funded by KDD International Telephone and Telegraph
49 Domains act like your street address, giving the postal service an exact location for your letters and parcels or the telephone numbers than ensuring the calls get through to your house or business.
50 Hine
51 Doug Edmeades MSc (Hons), PhD, DipManag, MNZSFM, *New Zealand Science Review* Vol 61 (3–4) 2004. nzas.rsnz.org/publish/archive/NZSR_61_3_4.pdf
52 Ibid

FOOTNOTES CHAPTER 4

1 Marcia Russell, *Revolution: New Zealand from fortress to free market, Auckland*: Hodder Moa Beckett, 1996
2 D. Henderson, *Economic Reform: New Zealand in an international perspective*, NZ Business Roundtable, 1996
3 Alan Cameron and Claire Massey, *The New Zealand Experiment – Has It Worked For SMEs?*, New Zealand Centre for SME Research Management Systems Department, Massey University
4 Milner had been responsible for establishing the second satellite dish at Warkworth in 1982, refurbishing the original Warkworth satellite station a year later and building the earth stations in Wellington and Rangiora
5 Selwyn Arrow, *Looking Back to Tomorrow*, NZ Computer Society, 1985, p115
6 Colin Beardon, *Computer Culture: the information revolution in New Zealand*, Reed Methuen, 1985, p154
7 *Time* cover story, 3 January 1983
8 Arrow
9 Source: The Poly wlug.org.nz/PolyComputer and Aamber Pegasus: www.applefritter.com/node/1502
10 Auckland University 1970–1974, Bachelor of Science in Physics & Mathematics, post-graduate studies in Computer Science
11 Stephen Bell, computer journalist, in *Looking Back to Tomorrow*
12 Arrow
13 Beardon, p14
14 Beardon, p29
15 LandWeber helped found the US university Computer Science Network (CSnet) and played a major role in the development of the global Internet. From 1982 LandWeber helped establish the first Internet gateways between the United States and countries in Europe, Asia, and Latin America, including co-operative relationships between CSnet and national network projects. His informal workshops led to the forming of International Networking Conference (INET), which since 1992 became the annual conference of the Internet Society. LandWeber has been president and chairman of the board of the Internet Society and its vice president for education. Source: www.cs.wisc.edu/~lhl
16 Former head of the Federal Networking Council of the United States, who headed the NASA Scientific Internet
17 Founder of Pacific Communications programme (PACCOM)
18 Ping: A test of response time between your computer and the host your are trying to connect to, a rapid response time is desired, a slow response time suggests poor performance or issues on the line or with configuration
19 Telnet is a user command and an underlying TCP/IP protocol for accessing remote computers, including requesting specific files. The result of a Tenet request would be an invitation to log on with a user ID and a prompt for a password
20 Interview with Nevil Brownlee, March 2007
21 Mark Davies, History of the Internet debate on NZNog newsgroup, March 2001
22 Michael Newbery, History of the Internet debate on NZNog newsgroups, March 2001
23 Mark Davies, History of the Internet debate on NZNog newsgroup, March 2001
24 Madin had built the West Coast Federal Internet Exchange and helped convince the US government to move entirely to TCP/IP rather than the OSI protocols it had been contemplating. Madin invented the concept of the Internet exchange, which inspired Houlker to introduce a similar exchange (NZIX) at Waikato in 1990 and later in Auckland
25 On 17 October 1989 a magnitude 7.1 earthquake struck the San Francisco Bay area, collapsing a section of the San Francisco–Oakland Bay Bridge. Damage was estimated at almost $3 billion in San Francisco, half the total damage figure for the entire earthquake zone. The earthquake knocked out power to San Francisco, and the city was dark for the first time since the 1906 earthquake and fire. Power was fully restored by 20 October. Emergency telephone service became sporadic because a fire broke out in the 911 telephone equipment room. The quake killed 62 people throughout Central California, injured 3757 and left more than 12,000 homeless:

www.sfmuseum.net/alm/quakes3.html#1989

26 US-based UUNET Communications Services began operation in 1987 as a non-profit corporation providing Usenet feeds, email exchange, and access to a large repository of software source code and related information

27 Computer programmer Kevin Robert Elz, also known as kre, was a pioneer in connecting Australia to the Internet and more recently was involved in getting Thailand, where he now lives, on line. He helped develop Internet-based research in Australia and operated the .au domain name from 1986 through to the late 1990s and managed the .aus Usenet hierarchy from the 1980s. Some of his achievements include developing a number of important Internet RFC documents, helping connect Australia to the worldwide Internet, developing the Internet-based research network within Australia, and operating the .au domain registry from 1986 through to the late 1990s. He also managed the aus.* Usenet hierarchy from its inception in the 1980s until the mid-1990s. Amongst undergraduate students within the University of Melbourne Computer Science Department in the mid-1990s, he was considered a semi-mystical figure, having written the BSD operating system's quota system and contributed to its timezone management system. He was rumoured to have a work contract that allowed him time off whenever cricket was being televised.
Source: en.wikipedia.org/wiki/Kevin_Robert_Elz

28 Stone was a Masters student who later went to Stanford University to complete his PhD. Can be contacted via Professor Peter Barett, his stepfather, who's in Earth Sciences at Victoria

29 PCroute and PCbridge are software programs for IBM PC computers that can convert a PC with the necessary network cards into an IP router (PCroute) or an Ethernet bridge (PCbridge).

30 Tony went on to work for Teletrend, which became Allied Telesyn

31 Ace routers were developed by the DSIR's Physical Sciences and the Information Technology Group, which became Industrial Research Ltd when the CRIs were formed in 1992. In January 1994 Network Dynamics Ltd acquired the network engineering team of IRL, the Ace Router and all rights from Industrial Research Ltd. It entered a partnership with Securicor 3Net in December 1994, which eventually purchased the company in 1996. In September 1997 Teltrend Inc acquired Securicor 3Net and the New Zealand operation became Teltrend (NZ) Limited. In turn it was acquired by Allied Telesis Japan, and became CentreCOM Systems before reverting to Allied Telesyn Research. The company now has a huge business supplying routers and network equipment worldwide with a 170-strong professional engineering division in Christchurch.
Source: www.alliedtelesyn.co.nz/jobs/ATL_Timeline_RevB.pdf

32 ECL subsequently become the country agents for Cisco then went through a series of transitions becoming Case, then Dowty and later Logical, which was purchased by IBM

33 The cable was a multi-mode fibre, carrying Ethernet from the 'thick-wire' (10base5) cable in the Hansard office to that in the GPO machine room

34 Now the National Archives building

35 Senior scientist in the library at Apple Computer in Cupertino

36 RS-232 defines the meaning of the different serial signals and their respective pin assignments on a standard 25-pin serial connector. For many years a RS-232-compatible port was a standard feature for serial communications, such as modem connections, on many computers. It remained in widespread use into the late 1990s

37 SCATA refers to the large-scale, distributed measurement and control systems used to monitor or control chemical or transport processes, in municipal water supply systems, to control electric power generation, transmission and distribution, gas and oil pipelines, and other distributed processes

38 MICR (magnetic ink character recognition) numbers on the bottom of a cheque

39 In 1984, the 'father' of the Freenet movement, Tom Grunder, created St Silicon's Hospital and Dispensary, a medical bulletin board system that was an asynchronous, interactive messaging system that allowed users to ask a qualified doctor medical questions. This doctor would answer within hours (Archee 1994, p 30). This grew into the Cleveland Free-Net (Morino 1995). Freenet became Grunder's trademark for the National Public Telecomputing Network (NPTN). As of December 1995, NPTN had more than 150 affiliated community systems (NPTN, 1995)

40 A program that searches for file names and resources on the Internet and presents results in hierarchical menus. As users select options, they are moved to different Gopher servers. Where links have been established, Usenet news and other information can be read directly from Gopher. Originally introduced in 1991 at the University of Minnesota, and named after the school's mascot. There were more than 7000 Gopher servers on the Internet at its height. Popularity declined as Web content increased throughout the 1990s. www.answers.com/topic/gopher

41 A program that searches the Internet for specific resources by description, not just file name. Using Boolean searches (this AND this, this OR this, etc.), users can search Gopher servers to retrieve a selected group of menus that pertain to their area of interest

42 The Telecommunications Users Association of New Zealand

43 It quickly became permanent

FOOTNOTES CHAPTER 5

1 Interview with Keith Newman

2 It never happens

3 Speech to TUANZ by SOE Minister Richard Prebble, 7 August 1990

4 Gordon Campbell, 'Tough Calls,' *NZ Listener*, May 17–23, 199?

5 Williamson says he has all the media clippings and documents if anyone challenges his take on what was happening

6 *Network World*, 12-06-89, Networked PABXs in high-speed link

7 The Commerce Commission withdrew its long running action against Telecom's Megaplan pricing in March 1995. It concluded

the time and costs involved in pursuing this matter to finality would be greater than any benefits that might result. It was no surprise that seven years after the complaint was made, the telecommunications environment had changed so much that no important precedent was likely to be established. Commerce Commission Press Release 31 March 1995

8 Keith Newman, Satellite link offers glimpse of future, *Network World*, May 29, 1989

9 Frank Bajak, *The Press*, Tuesday, 1 June 1993

10 The shoot or branch of a creeping plant or the handles on the kete of knowledge. Hiko = random or distant flashing, lightning or something beginning to shine

11 VUW router's change log says the Kawaihiko DDS links were operating from on 14 Jun 1990. Comments and clarifications by Don Stokes on NZnog newsgroups

12 Donald Neal, 'The Harvest Object Cache in New Zealand,' Information & Technology Services, University of Waikato

13 DSIR Act 1974 (section 5a)

14 Doug Edmeades MSc (Hons), PhD, DipManag, MNZSFM, *New Zealand Science Review* Vol 61 (3–4) 2004. nzas.rsnz.org/publish/archive/NZSR_61_3_4.pdf

15 Comments and clarifications by Don Stokes on NZnog newsgroups

16 There were several variants of Mosaic including Netscape which was also the company name used by Andreessen to market his new browser

17 Loosely based on Richard T. Griffiths (Leiden University): http://www.let.leidenuniv.nl/history/ivh/chap2.htm plus additional research

18 Based on Netcraft, Google and Yahoo statistics: http://www.boutell.com/newfaq/misc/sizeofWeb.html

19 MUDs (multiuser dungeon, domain or dimension) are a multi-player computer game that combines elements of role-playing games, hack and slash style computer games and social chat rooms. Typically running on an Internet server or bulletin board system, the game is usually text-driven, where players read descriptions of rooms, objects, events, other characters, and computer-controlled creatures or non-player characters (NPCs) in a virtual world. Source: en.wikipedia.org/wiki/MUD

20 The Simtel archive was first made available on the public Internet in 1993 after its original host on AARPANET was shut down. It was a colossal archive of shareware for various operating systems, particularly Microsoft Windows and MS-Dos

21 Project Gutenberg was founded by University of Illinois student Michael Hart in 1971. It is a volunteer effort to digitise, archive, and distribute cultural works. Most of the items in its collection are the full texts of public domain books

22 The PACCOM consortium, partly funded the original connection of Internet sites in New Zealand to the rest of the Internet in the United States, via a gateway located at the University of Waikato

23 John Houlker interview with Keith Newman, *New Zealand Herald*, July 1998

24 From the minutes of the Tuia Society meeting November 1994

25 John Houlker as quoted in the minutes of the meeting

26 NZ becoming telecomms hub, says Hunt, by Keith Newman, *Computerworld*, 9 July 1990

27 Media briefing document, 18 May 1992

28 Dave King, 'IT Industry calls Govt bluff,' *The Dominion*, June 1992

29 Peter King, Telecom invests in 'vision,' *The Dominion*, 6 July 1992

30 Telecom media release in support of the WCL, 18 June 1992

31 Interview conducted by Keith Newman for feature article in mid-1993

32 Brown was later killed when his plane crashed in Bosnia

33 Godzone, Bob Johnson, *Wired*, November 1995

34 Hicks insists one of those people was instrumental in setting up Telecom's Xtra ISP seven years later

35 Letter from Clive Elliott and Alex Mcdonald of lawyers Baldwin Son and Carey to ISOCNZ's lawyers Rudd Watts & Stone on 18 September 1996

36 In Qantas Airways Limited v The Domain Name Company Limited (2000) 1 NZECC 70-005, the defendant registered the domain name qantas.co.nz. It then attempted to sell the name to Qantas. The High Court was quick to condemn this and ordered the defendant to de-register the name. The Court found that such actions were a deliberate blocking of the lawful exploitation of the name and a fraudulent use of Qantas's goodwill

Dominion Breweries was also successful in its Court action to get the domain name db.co.nz back from the Domain Name Company in DB Breweries Ltd v The Domain Name Company Limited (2000) 1 NZECC 70-009

37 International Networking conference relating to governance and other issues of concerns to the Internet community

FOOTNOTES CHAPTER 6

1 www.theregister.co.uk/odds/bofh

2 *The Malleus Maleficarum* (The Hammer of Witches, Witch Hammer, or the Hexenhammer) is the most infamous treatise on prosecuting witches to have come out of the Middle Ages in Europe. It is a comprehensive witch-hunter's handbook first published in Germany between 1486 and 1487. The 14 editions that arise from the original spread throughout Europe and had a profound impact on witch trials on the Continent for about 200 years. This work is notorious for its vivid misogyny and equating witchcraft with heresy. The Malleus was originally prefaced by the main papal document on witchcraft issued by Pope Innocent VIII on December 5, 1484. It mentions Inquisitors James Sprenger and Heinrich Kramer by name and directs them to combat witchcraft in northern Germany. Source: Wikipedia en.wikipedia.org/wiki/Malleus_Maleficarum

3 Fidonet was founded as a non-commercial network in 1984 by Tom Jennings of San Francisco, California as a means of networking BBS that used his own Fido BBS software. Other BBS software over time was adapted to support his Fidonet protocols and the network became a popular means for hobbyist computer users to communicate. Fidonet has designated co-ordinators at each level to manage the

administration of nodes and resolve disputes. Network co-ordinators are responsible for managing the individual nodes within their area. The Fidonet system officially referred only to transfer of netmail, private messages between BBS users. A netmail message would contain the name of the sender and recipient and their Fidonet addresses and the system would route the message from one system to the other until it reached the intended recipient. Netmail allowed for the 'attachment' of a single file to every message which led to the automated distribution of files between BBS including games. By far the most commonly-used piggyback protocol was Echomail, which enabled public discussions similar to Usenet newsgroups. Source: en.wikipedia.org/wiki/Fidonet

4 Paraphrased from One Byte and You're Hooked, by Tess Redgrave,
New Zealand Readers' Digest, December 1990

5 Circuit riders explore Internet Web, *The Press*, 1 June 1993

6 Simpson later founded Aardvark as a successful Web news content provider

7 Tandy Radio Shack's home computer launched in August 1977 as a direct competitor to the Commodore PET 2001 and the Apple II. Initially the company was unsure how well the machine would sell and kept the initial production run to 3000 units. It sold 10,000 in the first month and 550,000 the first year. The TRS-80 came with cassette input for programs and storage and had to have a special extension to use floppy disks. The motherboard and keyboard were integrated into one unit. The basic unit came with 4k of RAM and later 16k. The processor ran at 1.77MHz. Ref: en.wikipedia.org/wiki/TRS-80

8 A small conspicuous constellation in the southern hemisphere in the Milky Way near the Southern Cross, also known as the Jewel Box or Kappa Crucis Cluster

9 Christina Enright, Strategic Behaviour of Internet Service Providers in New Zealand and the Performance of this Market, March 2000: www.iscr.org.nz/f241,4849/4849_ausnz_020600.pdf

10 From Michael Newbery, *A Short Catechism on the Internet*, Information Technology Services Victoria University of Wellington, revision 8, 3 June 1993

11 Essentially Prof John Hine, Mark Davies, Duncan McEwan, Bernd Gill, and Andy Linton

12 Copied to Bernd Gill at the Victoria University Department of Computer Science

13 www.wlug.org.nz/NetLink

14 Rack-mounted modems made New Zealand company Comcor Technology

15 A spin-off from the DSIR Industrial Research Labs which later became Allied Telesyn

16 The position was taken up by Sid Jones, who moved on to work for TelstraClear when it purchased NetLink

17 http://www.wlug.org.nz/NetLink

18 www.actrix.co.nz (original profile document since removed)

19 The Telnet (Teletype network) protocol provides a facility for remote log-ins to computers via the Internet, for terminal emulation. A telnet program running on a client can run a log-in session on a remote computer where commands can be read by a telnet server program. It was developed in 1969 and became one of the first Internet standards. A user may telnet remotely to check email or log in into account information and execute operating system commands on that remote computer. Telnet was considered a highly insecure means of accessing remote resources

20 Christine Robertson, 'Actrix joins multimedia centre,' *Evening Post*, 25 May 1996

21 A movement based around alternative economics, founded by James Robertson and based in London and offering a 'people-centred' approach as opposed to the approach taken by those who attend the annual G8 summits. TOES holds its annual gatherings to coincide with G8

22 Gerrit Bahlman was the IT manager at the time

23 Later acquired by Quicksilver and then Whoosh in 2006

24 Alan Marston's father, John Lesley Marston (Jack), was a member of the Communist Party of NZ before going off to WWII and on his return became a core member of the Dunedin Branch of the CPNZ. At the time the CPNZ was "aligned with China" but Marston after visiting China denounced Mao as a dictator and began siding more with the Russian version. His branch was expelled from the CPNZ and he went on to become a founding member of the New Zealand Socialist Unity Party. Source: www.ak.planet.gen.nz/people/alan/dad2.html

25 www.pl.net/productPages/philosophy.htm

26 Combining the functionality of a bridge and a router

27 An open source computer operating system which is essentially a free variant of Unix. The project to begin compiling together such a system began with the GNU Project and was ultimately pieced together when Fin Linus Torvalds wrote the kernel in 1991

28 Biddle later became a lecturer in computer science at Victoria University

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2 Brian Rudman, 'How to net a family fortune,' *Weekend Herald* 17–18 July 1999

3 Internet Relay Chat (IRC) is a form of real-time Internet chat or synchronous conferencing. It is mainly designed for group (many-to-many) communication in discussion forums called channels but also allows one-to-one communication and data transfers via private message

4 KCCS Internet Hall of Shame. Page since removed

5 Midland was sold to Jets Internet in the last quarter of 1997

6 KCCS Internet Hall of Shame. Page since removed

7 Voyager initially charged $6.95 an hour and Xtra $4.95 per hour, but Voyager immediately dropped its price to $5.95

8 The Ihug/ESnet merger occurred on 29 October 1996

9 Brian Rudman

10 Chris Barton, *PC Magazine*, December 1995

11 Russell Brown, 'Telecom's Xtra agony,' *Unlimited*, Tuesday, December 1998

12 ICMP is one of the core protocols of the IP suite, chiefly

used by the operating systems of networked computers to send error messages, indicating, for example, that a requested service is not available or that a host or router could not be reached

13 KCCS Internet Hall of Shame. Page since removed

14 Russell Brown

15 The X-shaped junction was a shameless knock-off of the interface for Apple's eWorld according to Russell Brown

16 Telecom 1998 Financial Statements

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22 www,aardvark.co.nz, 23 December 1996

23 Steve Evans, 'Telecom cleared over Xtra but scrutiny continues,' The Dominion, 19 December 1996

24 Russell Brown

25 Ibid

26 Aardvark News, 2 December 1996

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30 Aardvark News, 20 December 1996

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34 OzEmail was later sold to MCI Worldcom

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many years he took a leading role in the IT industry and was former president of the ITANZ. He shared the award with Bill Gallagher, CEO of multi-national manufacturing and marketing company Gallagher Group and son of Bill Gallagher Sr, who founded the company on the success of the electric fence. The company specialises in integrated security systems and specialised plastic products

66 Sir Angus, who died early in 2007 was the first inductee into the PriceWaterhouseCoopers New Zealand HiTech Awards, Flying Kiwi Hall of Fame

67 A global ERP software business acquired by Geac Corporation in 1990

68 A term apparently coined by Sheldon Renan, founder of Wibiki, which relates to the extent to which the individuals are linked to one another. "The emerging fabric of ubiquitous connectivity – not the technology, but the difference it will make between our past and our future"

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Acronyms and explanations

3G: as opposed to 2G. Third generation digital mobile cellular network, geared for high-speed throughout and multimedia applications.

Acoustic modem: device for connecting computers before the invention of the electronic modem. Acoustically coupled modems were fitted over the phone handset to send and receive data streams that could be understood by computers.

ADSL (asynchronous digital subscriber line): enhances computer communications over twisted-pair telephone lines where the download path is much greater than the maximum upload. For example Telecom's network in 2007 is capable of at least 7Mbit/sec download and 512kbit/sec or greater upload speeds. Most users are however only getting 2–3Mbit/sec download speeds.

ADSL2+: ITU standard that has the potential to deliver speeds of up to 24Mbit/sec downstream and 3.5Mbit/sec upstream. It is operational in many countries and equipment to enable this enhancement was being installed by Telecom during 2007–2008.

Ajax: a Web 2:0 development technique for creating interactivity or making Web pages feel more responsive by exchanging small amounts of data with the server behind the scenes. This increases to increase speed and functionality so the page doesn't have to be reloaded each time the user requests a change.

ARPA: see DARPA.

Archie: derived from the term archive. A search utility for locating files on FTP sites.

ARPANET: the world's first operational packet-switching network. The developments made in the research laboratories of the US Defense Department's Defense Advanced Research Projects Agency (DARPA) delivered what was the predecessor of the Internet. It became the more research- and academic-focused NSFnet (National Science Foundation network) that linked computer science departments, providing open access to supercomputers.

ATM (asynchronous transfer mode): a cell relay or circuit switching network protocol which encodes traffic into fixed cell sizes or frames rather than packets over fibre-optic cable. It was widely used for wide area networking (WAN) and many carriers used it in their network backbones but the increasingly converged nature of modern backbone networks saw it rapidly replaced by more efficient networking protocols. Also stands for automatic teller machine.

Backbone: the main trunk high-speed fibre network across the nation feeding exchanges, routers and hubs that connect into or distribute data to individual networks or ISPs.

Backhaul: the backbone network infrastructure, typically fibre-optic cable and the related electronics that deliver capacity for Internet and phone traffic from the provider's exchange into and out of our towns and cities. The backhaul may be from Telecom or TelstraClear to an ISP or wholesale customer. Without sufficient backhaul to meet the demands of local users a bottleneck arises, slowing network performance. Backhaul may also be cellular, wireless bandwidth.

Bandwidth: transmission capacity or data throughout capability. The greater the bandwidth, the more capacity there is for carrying voice, video or data. The number of bits flowing through the telecommunications lines are usually measured in kilobit, megabits, or gigabits per second (Mbit/sec).

Baud: the speed at which a computer modem transfers data. While technically speaking it's not identical to bits per second, the speed is close enough so this book has used bit/sec and kbit/sec for modem speeds.

BBS (bulletin board system): a precursor to the Internet, where users dialled in to a remote servers, often in someone's home or garage, to exchange or post messages or participate in public forums. After about 1986 BBS often included UUCP or FTP Internet content and email access. BBS, like today's social networking sites, were often based around communities of interest and offered downloadable material, discussion groups and the ability to chat or play games on-line.

BGP (border gateway protocol): used mostly by ISPs to share information about different networks. BGP itself is a complex exterior routing protocol that is used in conjunction with autonomous systems.

Bitnet: it came to mean 'Because It's Time Network,' although the original meaning was 'Because It's There Network.' It started out as a small network for IBM computers in 1981. It was used by Waikato University to gain access to on-line resources before it achieved full interconnection into the US Internet backbone. In October 1994, Bitnet encompassed 1,481 host computers by academic and research institutions all over the world. It had around 111,000 users in 1995. It spanned North America, Europe and some Persian Gulf states but as TCP/IP systems reached maturity and the Internet went mainstream its popularity rapidly diminished.

Blog: short for Weblog. A regularly updated on-line diary or chronological series of reports report on any topic. Some bloggers comment on current affairs or news of the days while others are content to talk about their hobbies or interests. Most blogs have room for readers to agree, disagree or add their own views. Part of the blogosphere or connected blogs.

Browser: graphical user interface or Web browser for searching and navigating Internet hosted Web pages. A standard part of a computer operating system. They're becoming increasingly sophisticated and will ultimately become highly personalised. The first browser that shifted the game away from text navigation was Mosaic, developed at the National Center for Supercomputing Applications (NCSA) from late 1992 by Marc Andreessen and Eric Bina. Andreessen, along with Jim

Clark, a founder of Silicon Graphics and four other former students and staff of the University of Illinois, started Mosaic Communications. It later became Netscape Communications, which produced Netscape Navigator. While the original Microsoft Internet Explorer featured elements of Mosaic, after a dispute over licensing all elements were removed and Microsoft went its own way.

BSD (Berkeley Software Distribution): formerly known as the Berkeley version of Unix, now simply called the BSD operating system. This Unix variant and its utilities, developed and distributed by the University of California at Berkeley, delivered the first TCP/IPNetworking stack that extended the Internet revolution beyond the military and academic circles. It usually included the version number; for example, 4.3 BSD. The BSD TCP/IP stack was the model for most subsequent TCP/IP implementations. Development is continued by three groups of 'user communities': FreeBSD, OpenBSD and NetBSD.

Cabinetisation: the process of moving smaller cabinets containing the electronics required for local loop access, including DSL and fibre-optics, closer to the customer. While shortening the copper loop and speeding up the capabilities of the network this also means each cabinet serves fewer customers.

CERN (Centre for Particle and Nuclear Physics): the world's largest particle physics laboratory located in Geneva, Switzerland. A circular, very high-energy particle accelerator that accelerates protons through the action of magnetic fields and a high-frequency electric field

CDMA (code division multiple access): a radio spectrum sharing technique used in digital mobile networks, including Telecom's 027 network.

Coloured Book: a set of complex X.25 protocols, denoted by colour, used on Janet (joint academic network) and other emerging networks between 1980 and 1992 until Internet (TCP/IP) protocols overtook them. Pink was for communication over Ethernet, Orange over local networks, Yellow over X.25, Green to connect terminals, Fawn for screen management, Blue for file transfer, Grey for email and Red for job transfer and management.

Cyberspace: a term coined by science fiction writer William Gibson in the 1980s, referring to a futuristic network where users mentally travelled through a matrix of data. Now used generally to refer to the Internet, which hadn't been invented at the time of his vivid imaginings.

Daemon: not a horned creature from the netherworld but a background process in the Unix operating system that lies dormant waiting to perform some useful task. The sendmail daemon, for example, continually runs but becomes active only when email is sent or received.

DARPA (Defense Advanced Research Projects Agency): an agency of the US Department of Defence responsible for the development of new military technology, including funding the research that led to the overall structure and specifications for computer networking and ultimately the Internet, including hypertext linking. Established in 1958 in response to the launch of the Soviet satellite, tasked with helping the USA military technology keep ahead of its enemies. It was originally known as Advanced Research Projects Agency (ARPA), but renamed DARPA in 1972 then back to ARPA a decade later and to DARPA again in 1996.

Data caps: the restriction on the amount of data subscribers can download (or upload) each month. This can vary from 600Mb to 1Gb as a standard offering but on higher end accounts through some ISPs it is now 10Gb and more. If you exceed your data cap you are charged a per Mb fee and/or the speed of access is drastically reduced.

DEC PDP (Programmed Data Processor): a series of highly successful computers made by Digital Equipment Corporation (DEC).

Delurk: here's lurking at you. To come out of on-line lurking mode to participate in a discussion after a period of merely observing. Derived from episodes of Star Trek that feature Klingon warships that can hide 'cloak' or 'decloak' at will.

Digital: as opposed to analogue, linear or sequential. Digital reduces everything to a series of zeroes and ones, or on and off switches as an electronic representation of its source material whether it is text, photographs, sound or video. Computers code and decode endless streams of zeroes and ones as they process our files.

Download speed: speed at which Internet users download data. Until 2005 this was restricted to 128kbit/sec, 256kbit/sec or 512kbit/sec in New Zealand unless you were a customer of Telecom or of a provider that had its own infrastructure. The speed was bumped up to 2Mbit/sec and a determination struck in December 2005 meant speeds of 3.5Mbit/sec became available to all ISPs. Local loop unbundling was expected to boost download speeds to 7Mbit/sec in the short term and with DSL2+ technology on the horizon carriers were proposing 8–24Mbit/sec services. The reality, because of the condition of the nation's copper infrastructure and the ancient NEC switches still being used, was likely to remain at 2–3Mbit/sec unless users were close to a roadside cabinet or exchange or lived in a new subdivision. The big hope was Telecom's NGN, due to be completed 2010.

DSLAM (digital subscriber line access multiplexer): a network device, usually at a telephone exchange or roadside cabinet, that separates the voice-frequency signals from the high-speed data traffic and controls and routes digital subscriber line (xDSL) traffic between the customer and the main carrier network. Cards used in exchanges, and increasingly in roadside cabinets to terminate DSL data circuits over copper telephone lines into a carrier's network. A number of customers can be supported on a single DSLAM although ADSL DSLAMs are now rapidly being replaced by DSL2+ ISLAMs which are smaller, deliver faster Internet access speeds and are more suited for roadside cabinets. With unbundling Telecom's competitors are able to locate their own DSLAMs in its exchanges and roadside cabinets.

DWDM (dense wave division multiplexing): technology that can send eight or more wavelengths down a single fibre-optic cable.

E1: 2Mbit/sec. European equivalent of a US-designated T1 circuit (est 1.5Mbit/sec) over a telephone network that can handle multiple connections simultaneously.

E3: 34Mbit/sec. European equivalent of a US-designated T3 circuit.

EBGP: the opposite to IBGP. It transports information to other BGP-enabled systems. However, EBGP is generally not used within the same AS. In rare cases, EBGP can be used in place of interior protocols (IGRP, RIP, etc.) through the specification of static routes.

EDI (electronic data interchange): the precursor to e-commerce, featuring rigid proprietary protocols for companies to securely exchange important documents including orders, invoices and payments within their dedicated trading communities.

Email (electronic mail): still the 'killer app' on the Internet and the most immediately useful tool. The email 'send and receive' service offered by your ISP, which acts as a post office service, routing your messages to their destination as part of your monthly fee. In many cases email is offered as a free service by major operators keen to have you add credibility to their on-line community.

Ethernet: a network topology and protocol invented by Robert Metcalfe at Xerox PARC in the early 1970s, initially used in local area networks (LANs) but now deployed in the wide area as well. Initial speeds were 10Mbit/sec but now 100Base-T (100Mbit/sec) is common over coaxial cable and 1000Base-T (1Gbit/sec) is used over more capable networks. Telecom is increasingly using Fast Ethernet in all its new DSL cabinets to speed up the capabilities of shorter copper lengths as fibre gets closer to the home.

FAQ (frequently asked questions): many more complex sites with large databases, offering downloads, on-line services, e-commerce and even social networking ask you to read up on basic instructions and rules governing use before clogging their helpdesk with questions that are already answered in the FAQ.

Fibre-optics: glass fibre communications cabling down which laser pulses transmit information at light speed. Fibre has been around since the '80s but is now much cheaper to deploy than copper and far more capable – able to deliver gigabit speeds.

FidoNet: founded as a non-commercial network in 1984 by Tom Jennings of San Francisco, California as a means of networking bulletin board systems (BBS) that used his own Fido BBS software. Other BBS software over time was adapted to support his FidoNet protocols and it network became a popular means for hobbyist computer users to communicate. FidoNet has designated coordinators at each level to manage the administration of nodes and resolve disputes.

Finger: a Unix utility that reports information about other users who have Unix accounts. Finger can tell you about users logged in and where and when a person last logged in to the system. A gesture by a programmer to a person they believe has ripped off their code without acknowledgement.

Firewall: based on the idea of having a firewall to stop a fire spreading. Software, hardware and the procedures put in place to segregate or protect one portion of a network from another, or the security protocols between the network and the Internet or outside world to stop unauthorised persons from accessing your LAN or your databases. A firewall may include a router or access server designed as a buffer or secure layer between public and private networks. A good firewall will include security, antivirus, anti-spam and anti-intrusion software, which examines all incoming and outgoing messages for viruses and spam and blocks all suspicious files.

Flame: an angry or often inflammatory response to a posting on a newsgroup; an offensive or insulting email following a breach of netiquette. A few retaliatory reactive responses based on a misunderstanding or volleys between groups on different sides of an argument – particularly in the bad old days – could result in a flame war that completely disregarded any pretensions at net etiquette.

Frame relay: a packet-switched data service, similar to X.25 used for LAN-to-LAN connections and out to metropolitan area networks (MANs) and wide area networks (WANs), well suited to bursty traffic. Speeds vary from 64kbit/sec circuits up to 45Mbit/sec speeds. It was superceded in some cases by ATM. Frame relay could be used for creating permanent virtual circuits and is an always-on technology. It mostly fell out of use with the advent of IP-based networking. It was used in the early days of the Internet for satellite and point-to-point connections between universities as part of the national Internet backbone in New Zealand.

Freenet: in 1984, the 'father' of the Freenet movement, Tom Grunder, created St Silicon's Hospital and Dispensary, a medical bulletin board system and interactive messaging system that allowed users to ask a qualified doctor medical questions. This became the Cleveland Freenet, which grew to embrace more than 150 affiliated systems in the medical and other communities. WCC IT manager Richard Naylor tweaked the model to provide a free dial-up service for ratepayers to access what was essentially public information and CityNet was born, making the council the second local authority outside of the US to offer such a service.

FTTH (fibre-to-the-home): taking fibre the next step from fibre to the cabinet or node directly into business and residential premises for high-speed broadband.

FTTN (fibre to the node): the same as fibre to the curb. The process of cabinetisation or shortening the local loop through taking the functionality of a larger exchange out closer to the customer with fibre links out to smaller cabinets where access equipment such as DSLAMs are located.

FTP (file transfer protocol): used to identify, access and move software, music, image or text files from one host to another with appropriate file conversion across a large range of hosts.

Gateway: telecommunication switch that provides international access. Internet and voice

telephony gateways are usually separated. Device used to connect or translate otherwise incompatible protocols from one network to another network or networks. This may include linking a local area network to a wide area corporate or campus network or a global network.

Gopher: originally introduced in 1991 at the University of Minnesota and named after the school's mascot. A program that searches for file names and resources on the Internet and presents results in hierarchical menus pointing users to different Gopher servers where the content they seek may be found. Gopher was very similar to the Web except it had a structured tree menu system rather than hyperlinks to find what you were looking for. Where links have been established, Usenet news and other information can be read directly from Gopher. There were more than 7,000 Gopher servers on the Internet at its height. Its popularity declined as Web content increased throughout the 1990s.

GSN (government shared network): a highly specified, robust common network created by bringing together the best gigabit-speed resources, ISP, security and wide area networking capabilities for use by local and central government.

HFC (hybrid fibre coax): a hybrid network of optical fibre cables of the transport network and coaxial cables laid to the home. This hybridisation offers a cost-effective manner of providing very high bandwidth in the transport network and hundreds of Mbps to the home, as coaxial cable is cheaper to purchase and install.

HTML (hypertext markup language): the standard scripting language used to format or describe the structure of Web pages which might include text, tables, graphics and other elements. It delivers a common view of the page to all browsers over the Web. It is a simplified derivative of SGML(standard generalised mark-up language), a widely used standard from the mid-1980s. Information and page layout is framed in markers or tags which tell the browser how everything should be viewed.

HTTP (hypertext transfer protocol): the ability to link from text in one document to another document within the same web site or out to related documents in any other web site. The rules governing the software that transports hyperlinked files.

Interconnection agreement: an agreement between two telecommunications services providers, exchanging traffic between the respective networks. The agreement includes quality of service and payment arrangements for transitioning traffic across networks.

Internet2: the US-led global science and research supercomputer network that had its originals in the late '90s, involving universities and research organisations around the world. New Zealand was a latecomer, only linking in 2006. Internet2 is now going through another phase of growth and is one of several major projects seeking to establish a more solid framework for the next generation Internet. The not-for-profit advanced networking group comprises more than 200 US universities in co-operation with 70 leading corporations, 45 government agencies, laboratories and higher learning institutions as well as more than 50 international partners.

Intranet: an internal, company-wide Internet-based network that gives secure access to important company information from price lists to processes, procedures, employment guidelines and newsletters.

Extranet: an extension of a secure internal intranet for use by business partners or those in the supply chain so they can access catalogues, price lists or core information needed to facilitate their relationship with that business.

IAB (Internet Architecture Board): has the big picture overview of how everything is strung together in the Internet. It is chartered both as a committee of the Internet Engineering Task Force (IETF) and as an advisory body of the ISOC. Its responsibilities include architectural oversight of IETF activities, oversight and appeal role in the Internet standards process and the appointment of the RFC (requests for comment) editor. It is also responsible for the management of the IETF protocol parameter registries.

IANA (Internet Assigned Numbers Authority): oversees global IP address allocation, DNS root management, and other Internet protocol assignments. IANA was administered primarily by Jon Postel at the Information Sciences Institute at the University of Southern California, under contract to the US Department of Defence and later the Department of Commerce. From 1 January 1999 it became an operating unit of the Internet Corporation for Assigned Names and Numbers (ICANN)

IBM System/360: a mainframe computer system family announced by IBM in 1964, the first to make a clear distinction between architecture and implementation, allowing compatibility across its range of models. Customers could purchase a smaller system with an upgrade path.

ICANN (Internet Corporation for Assigned Names and Numbers): oversees a number of Internet-related tasks previously performed by IANA. Its role includes managing the assignment of domain names and IP addresses including introducing new generic top level domains and defining policy. The technical work is referred to as the IANA function. The organisation was in late 2007 still engaged in moving out from under the US Government-based structure to become a fully independent body. Australian Paul Twomey was the president and CEO since March 2003 and from November 2007 New Zealander Peter Dengate Thrush replaced Vint Cerf as chairman of the ICANN board of directors.

IBGP (internal border gateway protocol): used 'inside' an autonomous system (AS). This works much like a 'network neighbourhood,' used inside the confines of its own AS, but cannot be used in conjunction with a different AS.

ICQ: the first super-popular instant messaging service.

IETF (Internet Engineering Taskforce): a large, open international community of network designers, operators, vendors and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. Its working groups on routing, transport, security etc largely co-ordinate via email and the IETF meets three times a year.

IGP (interior gateway protocol): a routing protocol used within an autonomous system (AS) in contrast to an exterior gateway protocol (EGP) which determines network 'reachability' between autonomous systems

IP (Internet protocol): open-system (non-proprietary) protocol suite which can be used to communicate across any set of interconnected networks including for LAN and WAN communications. A network-layer (Layer 3) protocol containing addressing information and some control information that enables packets to be routed between computers on packet switched networks. The Internet protocols consist of the transmission control protocol (TCP) and Internet protocol (IP). The IP suite includes lower-layer protocols but it also specifies common applications such as electronic mail, terminal emulation and file transfer. The current version is IPv4 but the roll-out of IPv6 is well underway with advanced networks adhering to the new numbering scheme that allows millions more addresses to be used for identifying connected devices. Also an acronym for intellectual property

IPNet (Internet Protocol Network): Telecom's proprietary network that removes Internet traffic from the PSTN at each switching exchange and sends it to its destination (usually an ISP) via an Internet-optimised backbone.

IRC (Internet relay chat): a form of real-time Internet chat or synchronous conferencing. It is mainly designed for group (many-to-many) communication in discussion forums called channels, but also allows one-to-one communication and data transfers via private message.

ISDN (integrated services digital network): a transmission system that can carry a range of digital voice, data and images over increments of 64kbit/sec. A Basic ISDN line is 2B + D (2 x 64kbit/sec plus a 16kbit/sec signaling channel) while a higher end Premium service providing up to 30 x 64kbit/sec for PBX use and was regularly used by ISPs in New Zealand as an alternative to having hundreds of modems at the end of dial-up lines.

ISOC (The Internet Society): a not-for-profit organisation founded in 1992 to provide leadership and open development of Internet-related standards, education and policy. ISOC has more than 90 organisational members and 26,000 individual members. It has offices in Washington and Geneva. The Internet Society provides leadership in addressing issues that confront the future of the Internet, and is the organisation home for the groups responsible for Internet infrastructure standards, including the Internet Engineering Task Force and the Internet Architecture Board.

ISP (Internet service provider): connects individuals and business customers to the Internet via dial-up modems or high-speed data links connected to telecommunications switches for routing. The ISP leases bandwidth from the national infrastructure service providers such as Telecom or TelstraClear. ISPs are increasingly becoming carriers in their own right with partnerships for internal and external network access and with local loop unbundling are able to place their own terminating technology within Telecom's exchanges and roadside cabinets. ISPs typically offer Web hosting, email, fast Internet access and a range of security and business solutions.

Janet (Joint Academic Network): a private British Government-funded computer network dedicated to education and research including higher education organisations and research councils. The majority of sites are connected via 20 metropolitan area networks across the United Kingdom. It is also linked to other European and worldwide. Janet is operated by JANET (United Kingdom), which is also responsible for the .ac.uk and .gov.uk domains. The system first went live in April 1983, hosting about 50 sites with line speeds of 9.6kbit/sec. In the mid-1980s the backbone was upgraded to a 2Mbit/sec backbone then 8Mbit/sec in the early 1990s sped the backbone to 8Mbit/s and the access links to 2Mbit/s, making it the fastest X.25 network in the world. The evolution of Janet helped standardise the Coloured Book X.25 protocols which confused the world for a while and leaned heavily towards the OSI (Open Systems Interconnect) seven layer model but then in 1991 it began testing out an IP pilot. Soon IP superceded Coloured Book use. Today JANET is primarily a high-speed IPNetwork. Today there are several advancements which use high-speed fibre-optic networking, which are designated SuperJanet.

KAREN (Kiwi academic and research network): the network cobbled together from various multi-gigabit providers which serves as the backbone for the country's high-speed science and research network linking local universities and science and research institutes and connecting into Internet2 and other international resources.

Linux: an open source computer operating system which is essentially a free variant of Unix. It originated with the GNU Project and was ultimately pieced together when Fin Linus Torvalds wrote the kernel in 1991.

Listserv: automated mailing list enabling on-line discussions of technical and non-technical issues via email. Originally designed for the Bitnet networks.

LLU (local loop unbundling): where the incumbent or dominant carrier is required to allow competing carriers to locate equipment in their exchanges or roadside cabinets to access to the 'last mile' into homes and businesses. New Zealand designated LLU in 2006 and gradually began opening up Telecom's network for competitors to deliver independent services late in 2007.

Local loop: an estimated 1.7 million copper links from Telecom's network that runs from exchanges or roadside cabinets into homes and businesses. For DSL technology to provide optimum broadband throughput the length should typically be no longer than 5km between the exchange and the premises, and is increasingly being reduced to hundreds of metres or less in build up and new sub-divisions. Also known as the last mile.

Mash-up: a Web 2.0 term typically denoting the combining of data, services or code from more than one source into a single integrated tool.

Mbone (multicast backbone): an early Internet service

which gave public access for desktop video communications or broadcasts. The quality at only three-five frames per second was poor compared to the 30 frames per second of standard TV television but it was in demand for a time for audio communication and sharing whiteboards or shared editing of documents between remote parties. It was also used to broadcast concerts around the world.

Modem (modulator-demodulator): an internal or external electronic device that converts digital signals from the computer into analogue signals for transmission through a phone line and then back into digital at its destination.

Mosaic: the first widely used Internet browser for the World Wide Web. There were several variants of Mosaic including Netscape, which was also the company name used by Marc Andreessen to market his pioneering browser.

MUD (multi-user dungeon, domain or dimension): multi-player computer games that combine elements of role-playing, hack and slash-style computer games and social chat rooms. Typically running on an Internet server or bulletin board system, the game is usually text-driven, where players read descriptions of rooms, objects, events, other characters, and computer-controlled creatures or non-player characters (NPCs) in a virtual world.

Naked DSL: unbundled bitstream access. The engineering term is shared spectrum. The opening up of a carrier's network so customers can purchase DSL services from one provider and phone services from another. A DSL line without dial tone so competing carriers can provide their own services apart from the main carrier's exchanges. Competitors provide their own equipment in exchanges or roadside cabinets and their own dial tone.

Netness: a term that conveys the extent to which individuals are linked to one another regardless of the type of networking is wired broadband, mobile, cellular or wi-fi or whether you are using a cellphone, laptop or connected PC.

Newbie: a naïve person, novice or someone new or with little experience on the Internet and its various services, including newsgroups, blogging and social networking.

Newsgroups: an important part of the early development of the Internet was the establishment of mailing lists and newsgroups where subscribers could discuss specialist subjects – an arena of the Internet often overlooked by newcomers who remain entranced by the wiles of the Web. The discussion groups, or newsgroups, news, debate and argument is generally known as Usenet.

NodeCode: software and protocols developed by John Paine at Australia's Commonwealth Scientific and Research Organisation (CSIRO), which enabled wider connectivity from early DEC PDP machines. It was offered free as long as users shared their own advancements with the creator.

Netiquette: from Net and etiquette. Internet etiquette. The appropriate behaviour for on-line citizens which ranges from not abusing each other to not using capital letters in emails (seen as shouting) and not posting to newsgroups or on-line communities without first understanding how they operate and what their expectations are from newbies. While the Internet is now more anarchic than ever, good manners still go a long way towards preserving your on-line reputation. Behave as if you are face to face with the person you are emailing or the group you are addressing. Avoid uncontrolled outbursts (the Web has a long memory) and treat others as you would like to be treated yourself and you'll be okay.

Operational separation: British Telecom did it voluntarily under pressure from regulatory body Oftel; Telecom New Zealand reluctantly began to comply this year. The idea is that the telecommunications giant is broken up into completely separate, arm's-length wholesale, retail and network divisions with their own management structure and no performance incentives across those borders. This is meant to result in a neutral wholesale division that deals with all customers, including Telecom's retail arm equally promoting fairer competition across the market and providing the right incentives for further investment in the network.

OSI (open systems interconnection): an attempt to create a standardised approach to computer networking at a time when multiple proprietary operating systems and network methodologies including SNA, Appletalk, Netware and DECnet among others had created confusion and an interoperability nightmare. The International Standards Organisation (ISO) and the ITU backed an industry effort from 1982 to try to get everyone to agree on a common way forward. Many vendors and whole countries began to back the complex seven-layer OSI model (application, presentation, session, transport, network, data link, and physical layers), even when it became clear the emerging TCP/IP protocol stack was far simpler and superior. The collapse of the OSI project in 1996 was a slap in the face for those organisations that doggedly pursued it despite the industry's rapid acceptance of IP.

Packet switching: sending data in packets through a network. Each packet has its own unique identification and destination address and even though they make take different routes they end up reassembled at the same destination. X.25 was an early packet-switching network protocol. The Internet is also a packet-switched network.

PACCOM (Pacific Communications): the direct international IP link between the US Internet backbone node in Hawaii from 1989, firstly with New Zealand then shortly afterwards Australia, Japan and Korea. The consortium, under the auspices of NASA, partly funded the original connection between the US Internet backbone and a gateway at the University of Waikato.

Peer-to-peer: a form of networking that does away with the notion of clients or servers and enables either party to act as one or the other, based on demand. The relationship is an equal person-to-person, computer-to-computer or peer-to-peer (P2P) one. This approach is used to share audio, video, data or other files. An example was Napster or Gnutella, where users seeking access to particular music or movie clips could download that content from any number of peers who might have it, while making content from their own hard

drives available to others. An important goal in peer-to-peer networks is that all clients provide resources, including bandwidth, storage space, and computing power. As nodes arrive and demand on the system increases, the total capacity of the system also increases.

Ping: a test of response time between your computer and the host you are trying to connect to. A rapid response time is ideal; a slow response time suggests poor performance or issues on the line or with configuration.

POP: points of presence. Wherever an ISP has a presence – a server or access point – in a particular location, for delivering email and Internet-based services. The data from the customer is then routed from the ISP's switch through the ISP's gateway to either a national or international Internet site.

Post Office: the Local Posts Act of 1858, two years after the new colony had been given greater autonomy from Australia, allowed for the appointment of a postmaster general and authorised provincial councils to establish post office services which were to be co-ordinated on a national basis. Ultimately the New Zealand Post Office would take control of banking through the Post Office Savings Bank along with telegraph and telex services, the telephone network for national and international calls and radio services including contact with ships.

PPP (point-to-point protocol): an early protocol used to enable a computer to connect to another computer or a remote server over a standard telephone line using Internet protocols and a modem. Its predecessor was SLIP (serial line interface protocol).

Project Gutenberg: a volunteer effort to digitise, archive and distribute cultural works, founded by University of Illinois student Michael Hart in 1971. Most of the items in its collection are the full texts of public domain books.

Protocol: set of standards defining how data is handled by the various computing and networking devices as it moves from point to point or point to multipoint. TCP/IP is the main set of protocols that enables the Internet to transparently handle so many forms of file transfer and communications.

REXX (REstructured eXtended eXecutor): an interpreted programming language developed at IBM and designed to be both easy to learn and easy to read.

RS-232: defines different serial signals and their respective pin assignments on a standard 25-pin serial connector. For many years a RS-232-compatible port was a standard feature for modem connections, on many computers. It remained in widespread use into the late 1990s.

Router: device that allows network traffic to be moved to its destination by the most efficient route.

RSS (rich site summary or really simple syndication): a must-have for many frequently changing sites. A family of Web feed formats used to publish frequently updated content such as blog entries, news headlines or podcasts. An RSS document can contain a summary of content or the full text from an associated web site. It can be read through an RSS reader or an aggregator, which summarises the content you have subscribed and will automatically update any new content it finds when you click on it.

Search engine: a software engine that allows you to search the Web with common search terms from your browser, looking for documents, files and photographs; eg Google, Yahoo!, AltaVista, Ask, HotBot, Lycos, AlltheWeb etc.

SMTP (simple mail transfer protocol): the de facto standard for email transmissions over the Internet.

Social networking: collaborative and conversational on-line communities of people with common or similar interests, using interactive web sites for sharing opinions, files and profiles; eg MySpace, Facebook, Bebo and LinkedIn. An association of people drawn together by family, work or hobbies. The term was first coined by Professor J. A. Barnes in the 1950s, who defined the size of a social network as a group of about 100 to 150 people.

Southern Cross Cable: the name given to the high capacity undersea fibre-optic cable that connects New Zealand with Australia and the US.

Structural separation: the path chosen in the US to split up AT&T and the regional Bell operating company telecommunications monopoly in 1983-84. The Baby Bells were split into separate competing businesses including Bell Atlantic and Ameritech and even BellSouth, which came to New Zealand to learn how to operate in a free market, failed to reinvest then sold off its shares for a huge profit.

Sub-loop unbundling: part of the local loop unbundling process where competing carriers can locate their equipment in smaller cabinets or exchanges closer to the premises either to deliver DSL over copper or ultimately access fibre cables.

TCP/IP (transmission control protocol): Internet protocol (see IP).

Telnet (teletype network): a protocol that provides a facility for remote logins to computers via the Internet for terminal emulation. The result of a Tenet request would be an invitation to log on with a user ID and a prompt for a password. Developed in 1969, it became one of the first Internet standards.

Troll: insulting term for a stirrer or unwelcome presence in a forum or other on-line meeting place. From 'trolling,' a type of fishing that involves dragging bait along and hoping a fish will take it. Initially used to describe a forum poster or IRC chatter who made intentionally outrageous comments.

Unbundling: the requirement for a major telephone company to open up its fixed line network to competing carriers. In New Zealand LLU means Telecom must allow competitors to install their own equipment in its exchanges to create their own independent networks based on reasonable commercial terms.

Unconstrained DSL or UBS: unconstrained bitstream access. Raw DSL speeds offered at the maximum speeds possible to wholesalers and those who place their DSLAMs on Telecom's network (see Naked DSL).

Unix: a multi-tasking, multi-user computer operating system

that set the pace for the development of the Internet by bundling TCP/IP software, which was then used by developers around the world to set up email and Internet access.

Upload speed: the return path on DSL used to send data from your email or in gaming or interactive applications. This becomes increasingly important for applications such as VoIP (voice over IP), which needs high-speeds both ways. Calls can be interrupted if the upload path isn't sufficient.

URL (uniform resource locator): the address you enter to find a Web page.

Usenet: a global bulletin board system where millions of people exchange public information on every conceivable topic. Predates the Web as the most active place for collaboration and sharing of ideas and data.

UUNET: US-based UUNET Communications Services began operation in 1987 as a non-profit corporation providing Usenet feeds, email exchange and access to a large repository of software source code and related information

Veronica: a program that searches the Internet for specific resources by description, not just file name. Using Boolean searches (this AND this, this OR this, etc.), users can search Gopher servers to retrieve a selected group of menus that pertain to their area of interest.

VDSL: Very high bit rate DSL supporting throughput sufficient for extremely high throughput such as video-on-demand and high definition TV. It can be both symmetric and asymmetric and provides up to 52Mbit/sec of bandwidth

VPN (virtual private network): created for organisations with more than one physical location. The private network is normally created through a telecommunications leased line service. ISPs have created private networks on the public Internet through passwords, firewalls and other security measures.

WAIS (Wide Area Information Service): a free text search engine otherwise known as Z39.50, which conformed to library standards

WAP (wireless application protocol): the standard for integrating the Internet with cellphones, pagers and other digital mobile devices. Its micro-browser displayed key information from specially designed web sites.

Warez: pirated software that has been cracked.

Web: the World Wide Web, the hypermedia system for organising information which didn't come into existence until 1990 and went through an exponential growth curve. From your Web browser you can type in a specific address or URL to get to any Web page.

Web cam: a camera and software on a computer that allows the users to view each others while conversing on-line. While primitive Web cams have been used to capture images of Mt Ruapehu erupting or view traffic congestion at peak hours, with broadband and higher resolution, today's cameras enable true videoconferencing across the world and also capture high-quality images.

Wikipedia: free and continually evolving on-line encyclopedia that is built on by anyone who can prove they know what they're talking about. Full references to any source material must be given and the pages are open for peer review by those who think they know better. A Web-based project operated by the not-for-profit Wikimedia Foundation. As of September 2007, Wikipedia had approximately 8.29 million articles in 253 languages. The English edition reached two million articles by 9 September 2007. Wikipedia regularly ranked among the top ten most-visited web sites worldwide.

WikiScanner: a programme devised by self-described American 'destructive technologist' Virgil Griffith, to identify the computers making alterations to Wikipedia.

WYSIWIG: what you see if what you get.

X.25: the first international standard packet switching network developed in the early 1970s and published in 1976 by the CCITT (now ITU). X.25 provides a connection-oriented technology for transmission over highly error-prone facilities, which were more common when it was first introduced. X.25 was designed to become a worldwide public data network similar to the global telephone system for voice, but it never came to pass due to incompatibilities and the lack of interest within the United States. It was used primarily outside the United States for low-speed applications up to 56kbit/sec such as credit card verifications.

DATA DEFINITIONS

Bit (b) 1 or 0

Byte (B) 8 bits

Kilobyte (Kb) 1000 bytes

Megabyte (Mb) 1,000kb

Gigabyte (Gb) 1,000Mb

Terabyte (Tb) 1,000Gb

Petabyte (Pb) 1,000TB

Exabyte (Eb) 1,000PB

Zettabyte (Zb) 1,000EB

Bits on the move: kbit/sec, Mbit/sec or Gbit/sec

DOMAIN NAME MANAGEMENT TERMINOLOGY

DRS (Dispute Resolution Service): An alternative process to court action, giving parties another mechanism to resolve disputes which may arise.

DNC: Domain Name Commissioner, an operational office of InternetNZ responsible for the day-to-day oversight of the .nz domain name registration and management system

InternetNZ: The organisation authorised to manage the .nz domain name space. InternetNZ established the Office of the Domain Name Commissioner to oversee the management of the .nz domain name space.

NZOC: .nz Oversight Committee, the sub-committee of InternetNZ with the delegated authority to provide effective stewardship of the .nz domain name space.

NZRS: New Zealand Domain Name Registry Limited, trading as .nz Registry Services, the organisation responsible for operating the .nz register. 100% owned by InternetNZ.

RAG: Registrar Advisory Group, set up to represent the collective interests of the Registrar community.

Register: The authoritative record of .nz domain names, managed and operated by the registry.

Registrant: The person or entity who holds the right to use a domain name.

Registrar: An entity that has been authorised by the Domain Name Commissioner to register domain names on behalf of registrants.

Registry: The entity that operates the .nz domain name register, providing access to authorised registrars.

Reseller: An agent providing registration services through a registrar. They have no official status in the .nz domain name space.

SLA: Service Level Agreement – an agreement between InternetNZ and NZRS (the registry) which outlines the standard of service NZRS has to deliver in managing the register.

SRS: Shared Registry System, a single database for registering and maintaining domain names which is able to be accessed by authorised .nz registrars.

2LD: Second Level Domain, a name at the second level of the .nz domain name hierarchy; for example, Internetnz.net.nz. In this example .net is at the second level. The .nz domain name space has several 2LDs to choose from.

DOWNLOAD GUIDELINES:

TV or video streaming

Needs at least 2Mbit/sec speeds. That's 256kb of data per second or roughly 15.4Mb per minute of video or TV. A subscriber with a 2Gb cap would run over their allotment after only 129 minutes.

MP3 music files

While these vary in size, depending on the length of the song they're typically 1Mb per minute, eg a three-minute song is 3Mb.

Video clips

Depending on size and resolution, a three-minute music video can use 5–20Mb depending on the quality (resolution) and the screen size you are using. A 30-minute clip could use up to 200Mb.

SOURCES:

The author's own understanding with a lot of help from various interview subjects plus Microsoft Encarta, PC World Encyclopedia, Webopedia: www.Webopedia.com, Wikipedia: www.wikipedia.com,

Answers: www.answers.com, CSGnetwork: www.csgnetwork.com/glossarye.html,

ISOC: www.isoc.org/isoc/, APStar Internet History: www.apstar.org/InternetHistoryAP.html

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Internet: A New Zealand User's Guide, David Merritt & Paul Reynolds, Penguin 1995

CONNECTING THE CLOUDS

What's that floating in the troposphere?

Can you send the lightnings that they may go and say to you, here we are?
The Old Testament, book of Job, 38:35

Why would you call a book about the history of the Internet in New Zealand, *Connecting the Clouds*, asked the publisher. Aotearoa[1], the Maori name for New Zealand, is typically translated the Land of the Long White Cloud, and in telecommunications and networking diagrams the symbol of a cloud infers any number of switches, routers, trunks, network devices and services between access and exit points.[2]

You never quite know what is behind a cloud: endless ocean, snow-clad mountains, lush green valleys, rolling hills and abundant birdlife. Or a vibrant, entrepreneurial nation waiting to prove its mettle on the world stage but constrained by years of under-investment in infostructure? Clouds can symbolise atmosphere or moods; their shape and colour can imply many shades of meaning. Dark and broody and under the weather or light, wispy, and elated. You can imagine shapes within the shapes if you take the time. Meteorologically, clouds can bring shade on a hot day, rain, thunder, lightning, even portents of the future; will it rain tomorrow or will the sun rise on a clear day?

It seems the early voyagers to New Zealand were guided during the day, on their long journey from the mythical Hawaiiki, by 'a long white cloud' by day, and at night by a 'long bright cloud.' Hine-te-aparangi, the wife of the mythical Kupe – the earliest of the Maori navigators to make it this far – exclaimed on seeing the peculiar cloud: "*He ao! He ao!* A cloud! A cloud!" Looking up at the night sky she may have been referring to the great Magellan cloud[3] near the bright star Canopus[4] in summer or a long, misty cloud behind which they discovered the pristine islands where the sun first rises on the world. According to authorities, the interpretation of Aotearoa can be big, glaring light;[5] continuously clear light; land of abiding day;[6] long, bright world; long, lingering day; or long, bright land.[7]

The word 'cloud' can also be used colloquially: 'clouding the issue'; for example, Telecom is clouding the issue deploying 'confusion as a marketing tool'[8] or suggesting 'many customers haven't found anything they can't do with dial-up'[9] – or the government setting its goals at 'broadband' Internet speeds that are long past their use-by date to get into the top half of the OECD top 30.

In telecommunications, a cloud refers to the public or semi-public space that exists between the points of a transmission. It is the unknown technical ether, where protocols, switching and the arcane mysteries of translating and seamlessly communicating between different networks are worked out before that data moves inexorably on to its destination, which may be other clouds in other buildings, cities or countries. More recently the term 'tag cloud' has been coined in relation to classifying or identifying content in social networking sites and Web 2.0–style folksonomies.[10] For example, tag clouds can represent groupings of 30-150 of the most popular tags, offering a more visual and intuitive way of displaying hyperlinks, icons and metadata for drilling drill down into specific information. This is particularly useful when tags are collaboratively created, or voted on democratically.[11]

Not only is the Internet – that great network of interconnecting networks – a connection of clouds, but the new social networks where individuals gather to collectively contribute are creating new formations of cloud collaboration.

Keith Newman, December 2007

FOOTNOTES

1 *Aotearoa* is made up of either two or three words, *Aotea* and *roa* or *Ao tea* and *roa*. *Aotea* could be the name of one of the canoes of the great migration, the great Magellan cloud near the bright star Canopus in summer, a bird or even food; *ao* is a cloud, dawn, daytime, or world; *tea* white or clear, perhaps bright, while *roa* means long or tall.

2 http://www.webopedia.com/TERM/C/cloud.html

3 Irregular dwarf galaxies orbiting our own Milky Way and easily observable from the Southern oceans

4 Canopus, a yellowish-white super-giant star, visible clearly in the nightsky over Wellington and in ancient times often observed as the Southern Polar Star and used for navigation

5 Hochstetter

6 Stowell

7 James Oakley Wilson, D.S.C., M.COM., A.L.A., Chief Librarian, General Assembly Library, Wellington, Te Ara, Encylocedia of New Zealand, 1966 http://www.teara.govt.nz/1966/A/Aotearoa/Aotearoa/en

8 Telecom CEO Theresa Gattung stating: "What has every telco in the world done in the past? It's used confusion as its chief marketing tool. And that's fine," Christchurch Press, 15 May 2006

9 Xtra's Chris Thompson, September 2003: "Many customers haven't found anything they can't do with dial up."

10 Also known as collaborative tagging , social classification, social indexing, social tagging

11 http://en.wikipedia.org/wiki/Tag_cloud and http://en.wikipedia.org/wiki/Folksonomy

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Note: Page entries in italics indicate that the reference is to a picture.

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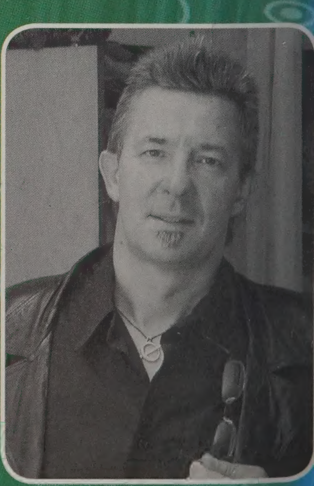

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